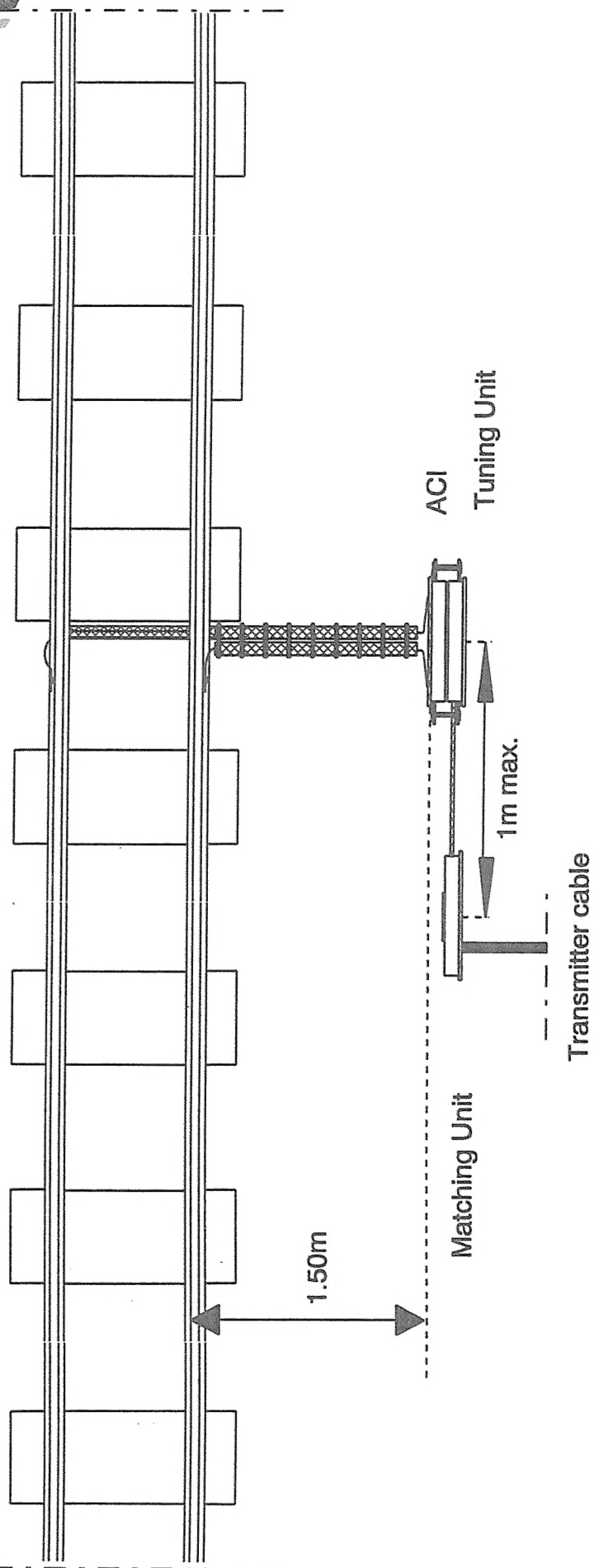
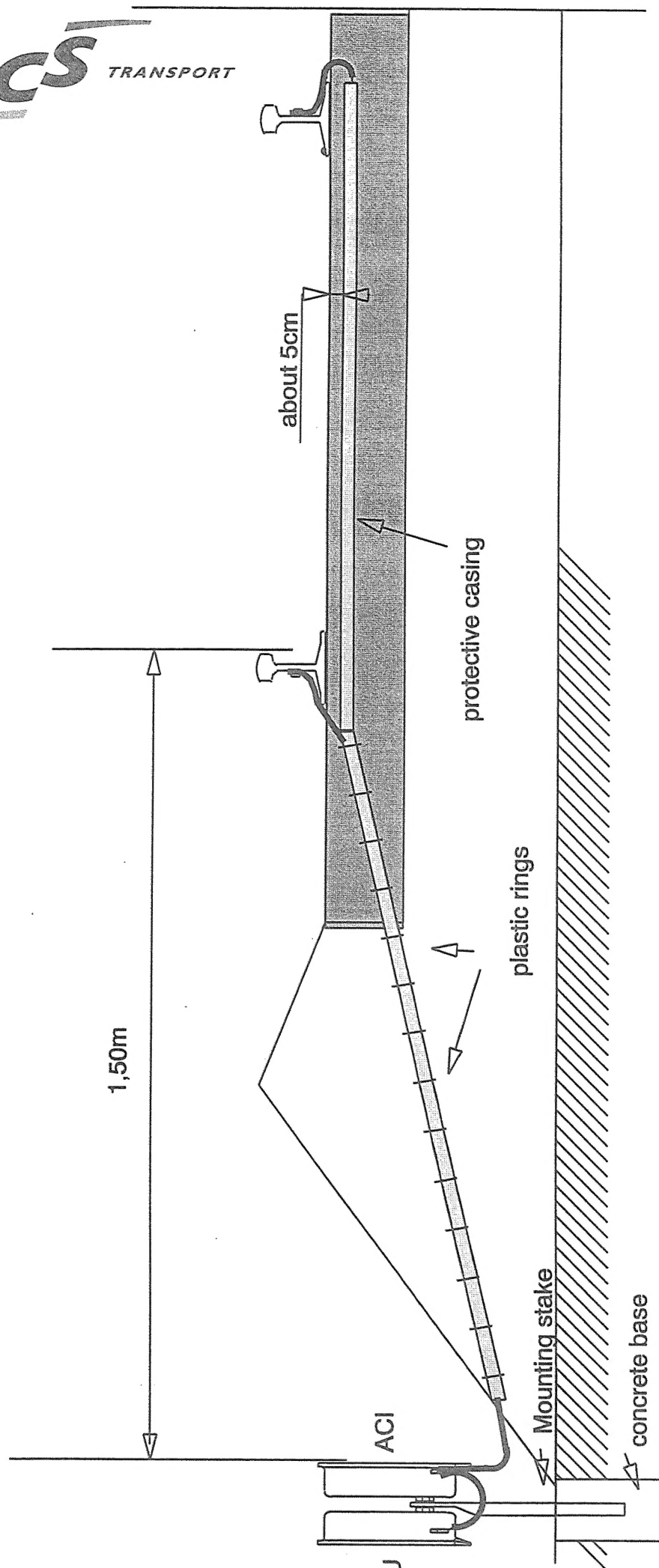


APPENDIX 23

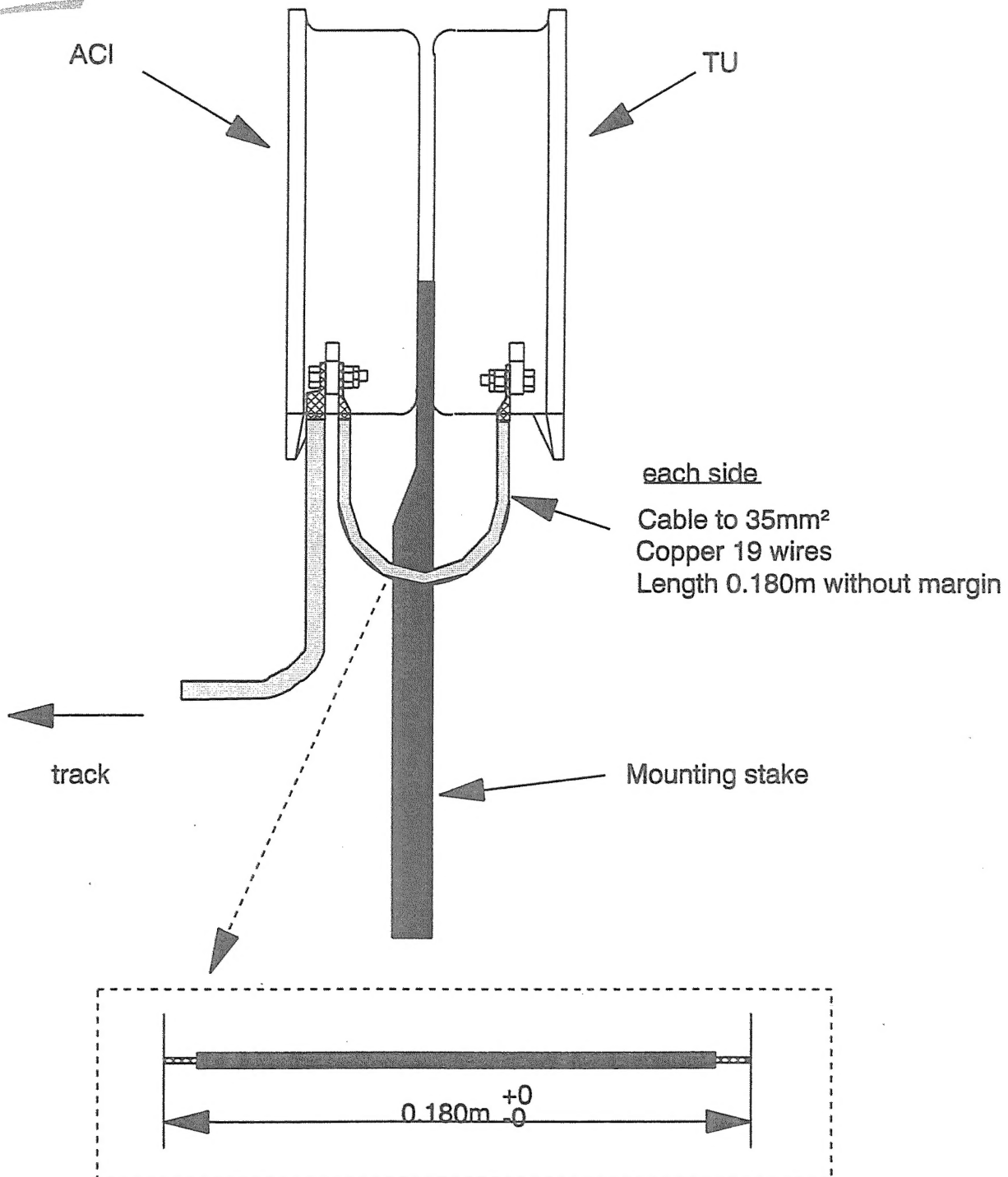
UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323	1	2	
	Page 128			



INTERMEDIATE TRANSMISSION - IT
Configuration

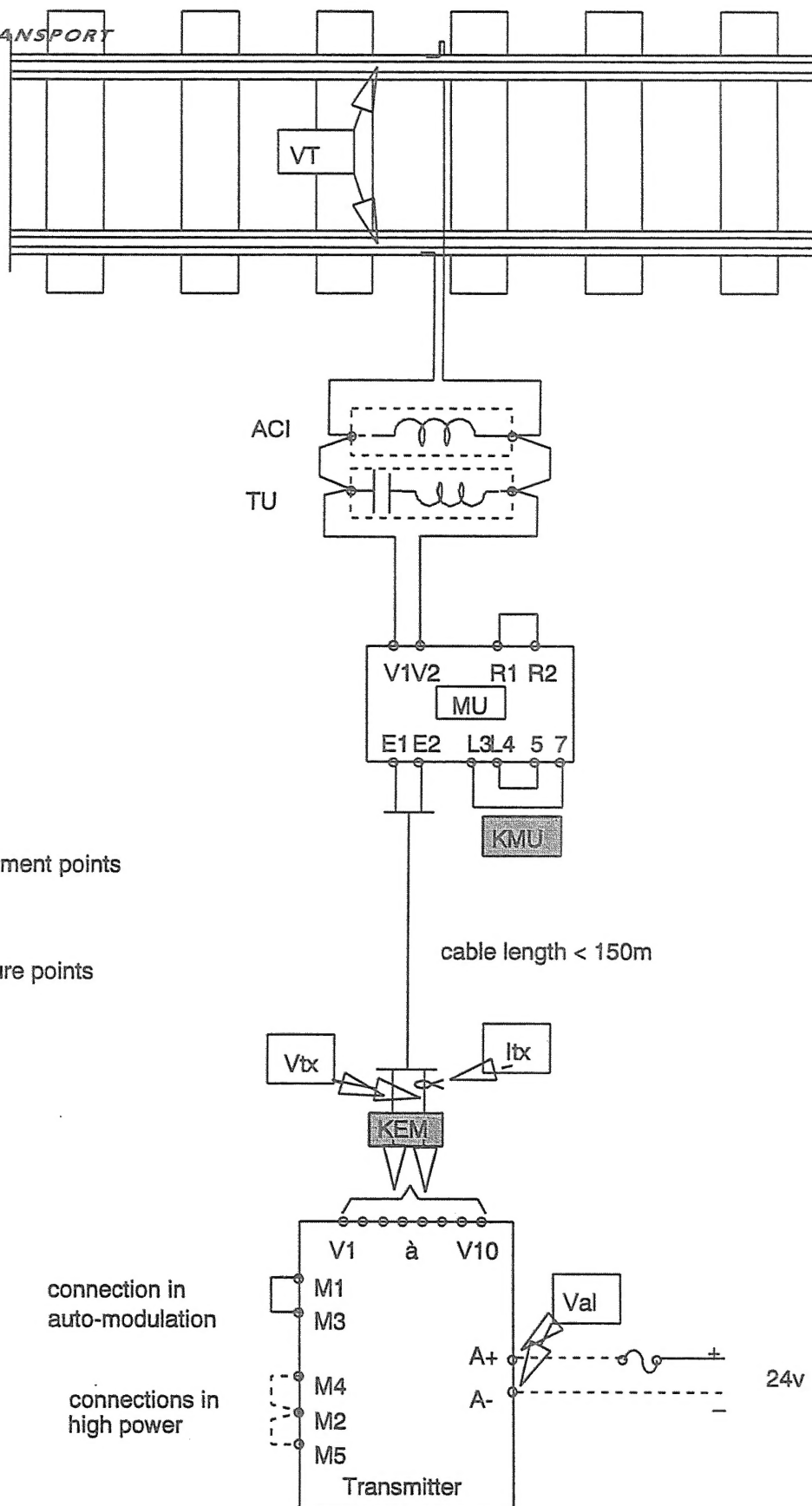
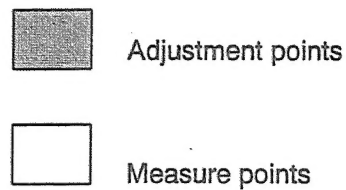


INTERMEDIATE TRANSMISSION - IT
ERECTING PLAN Air Core Inductor / Tuning Unit



ERECTING PLAN ACI / TU
DETAIL OF ASSEMBLING

UM 71 Track circuit

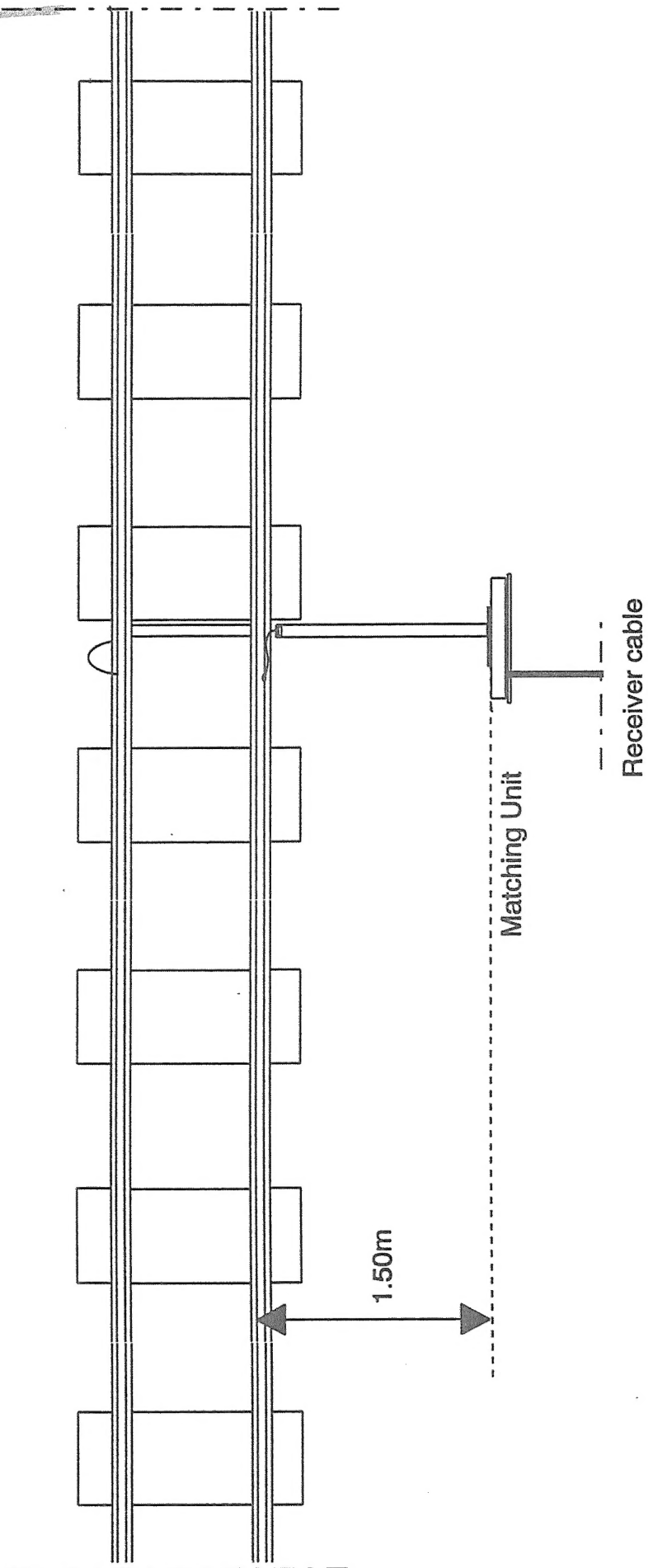


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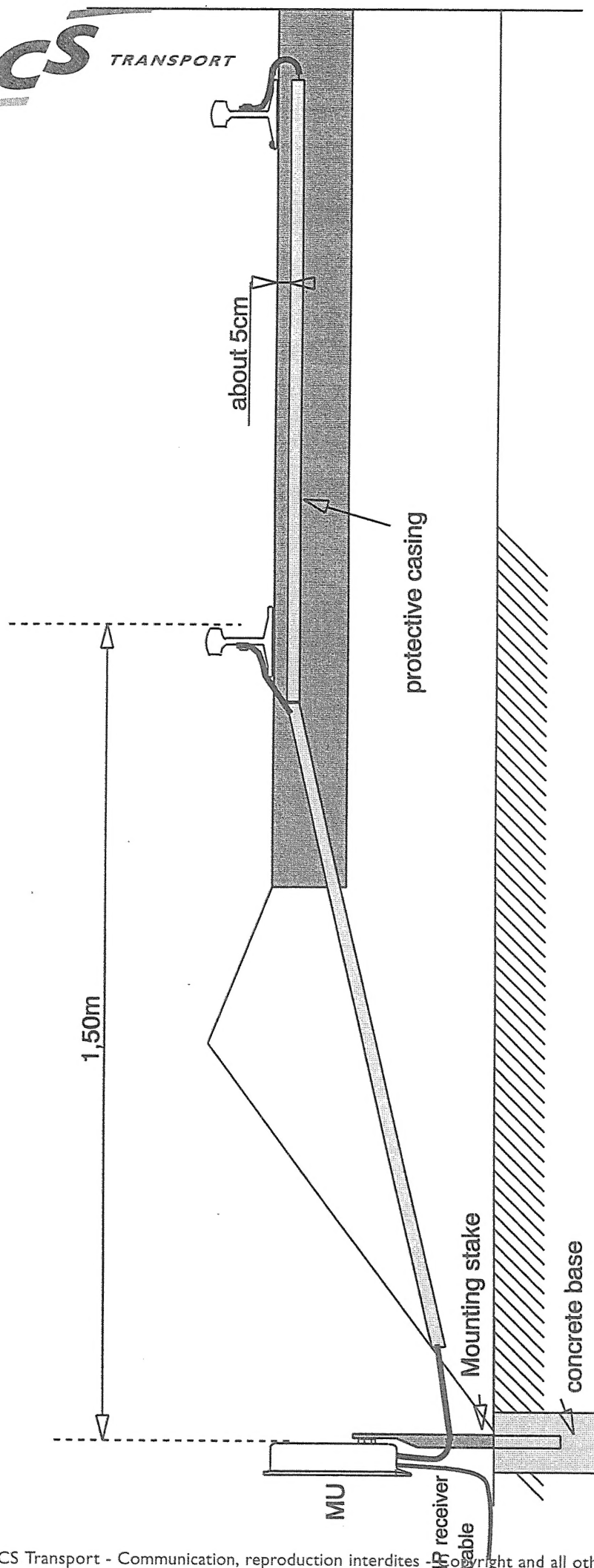
Cabling, measure and adjustment points

APPENDIX 24

UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323	1	2	
	Page 129			

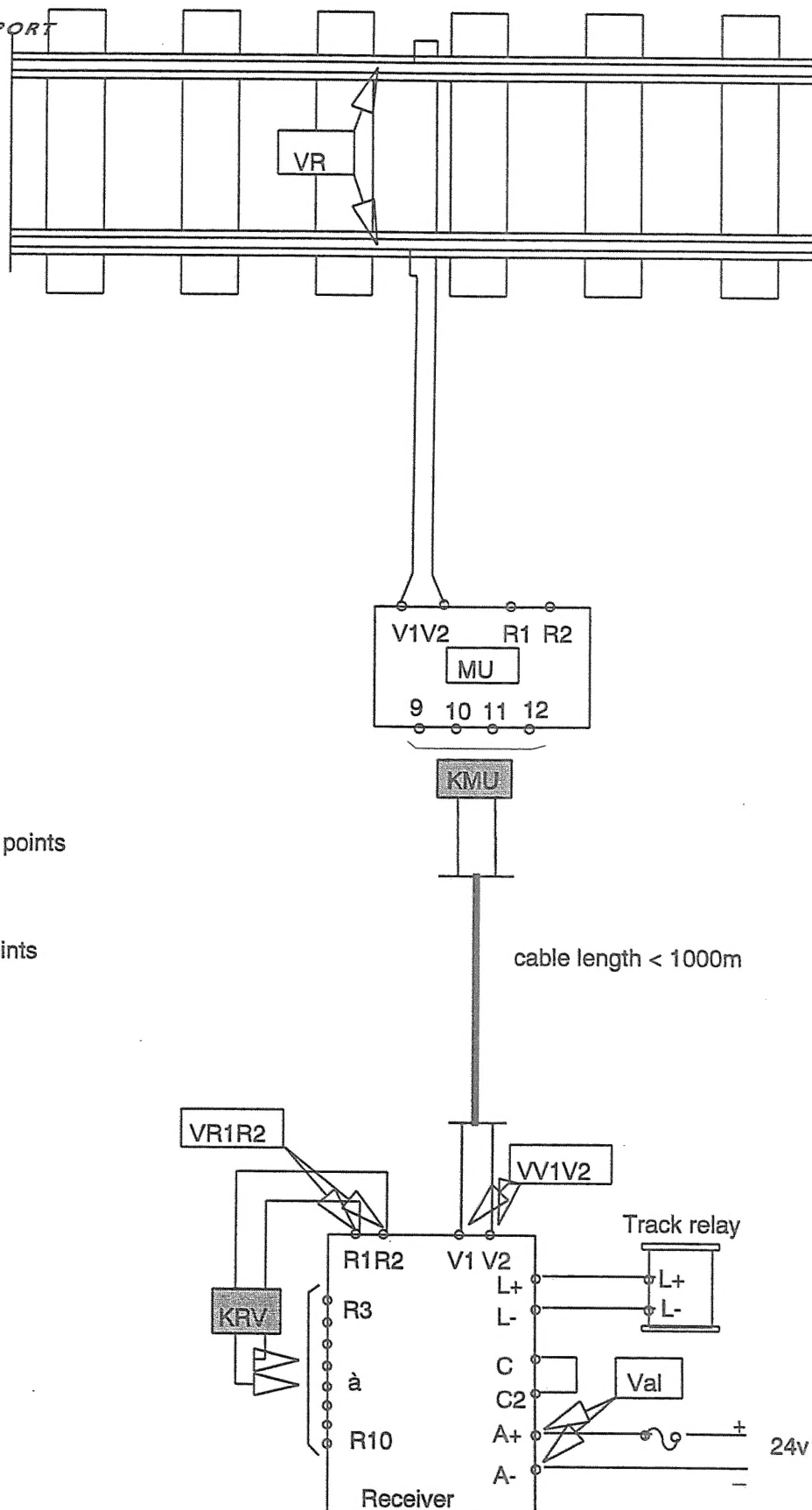
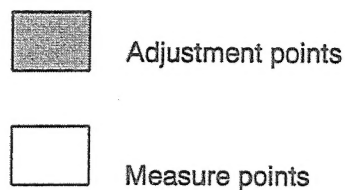


INTERMEDIATE DATA COLLECTOR - IDC
Information Point - IP - Configuration



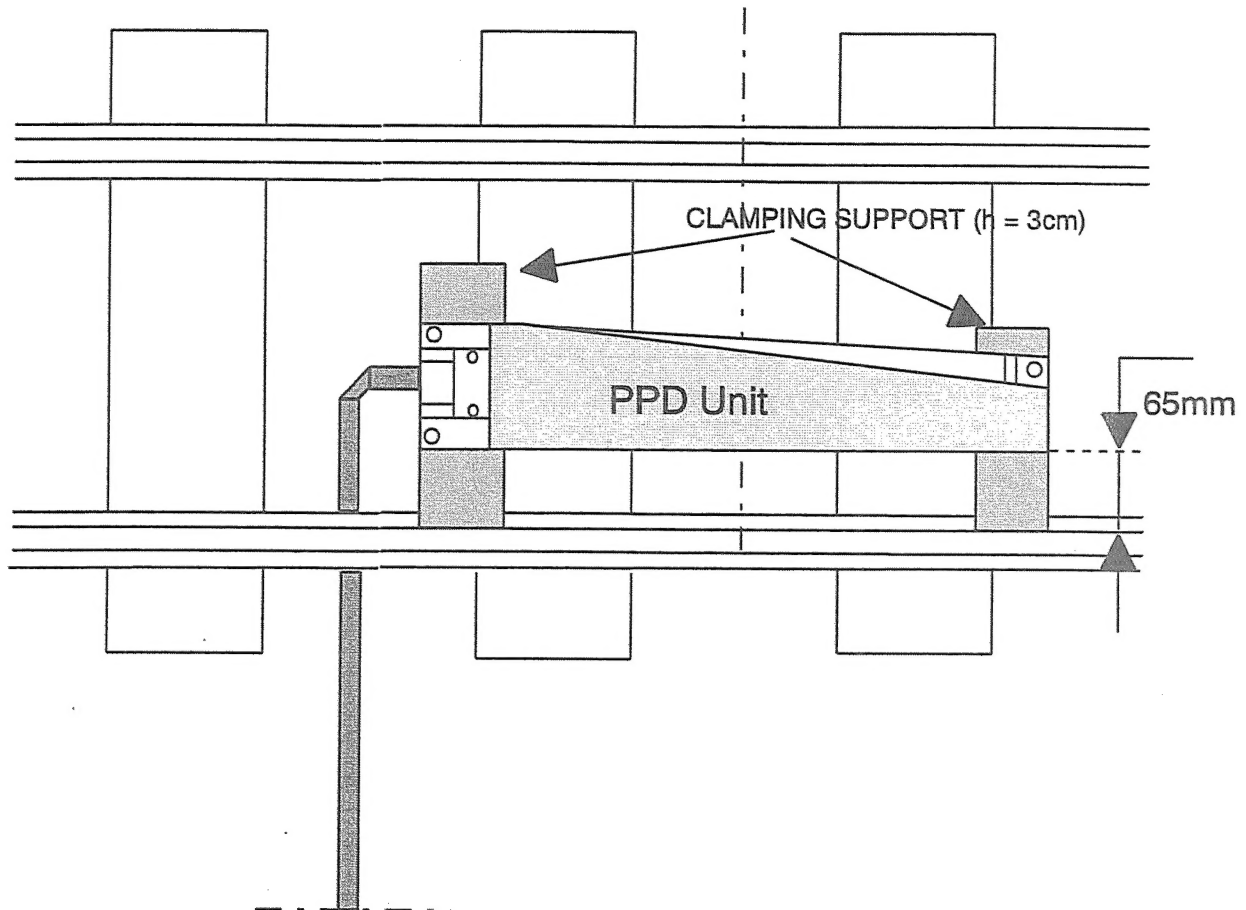
INTERMEDIATE DATA COLLECTOR - IDC
ERECTING PLAN - Matching Unit - MU

UM 71 Track circuit



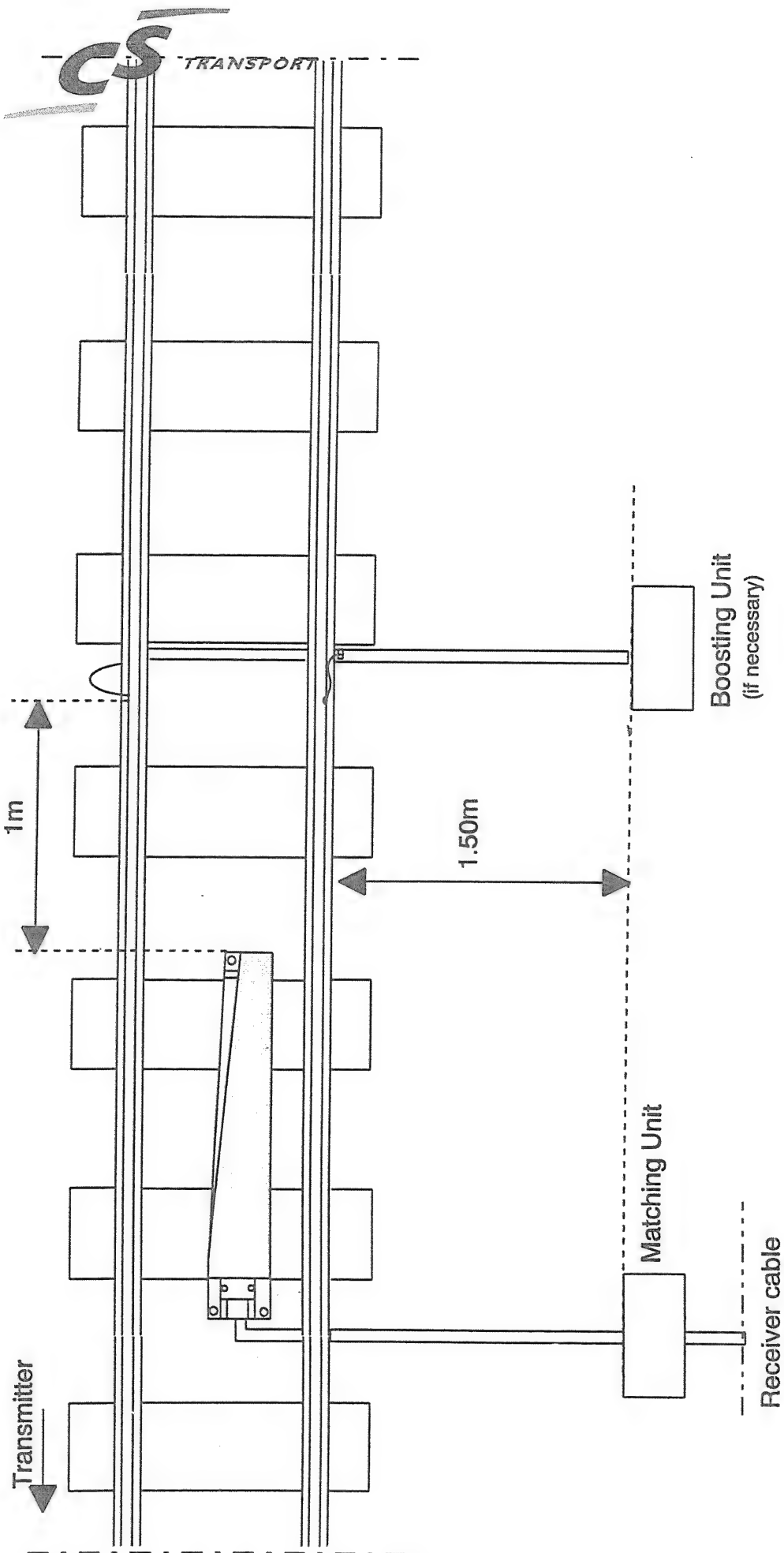
INTERMEDIATE DATA COLLECTOR - IDC INFORMATION POINT - IP

Cabling, measure and adjustment points

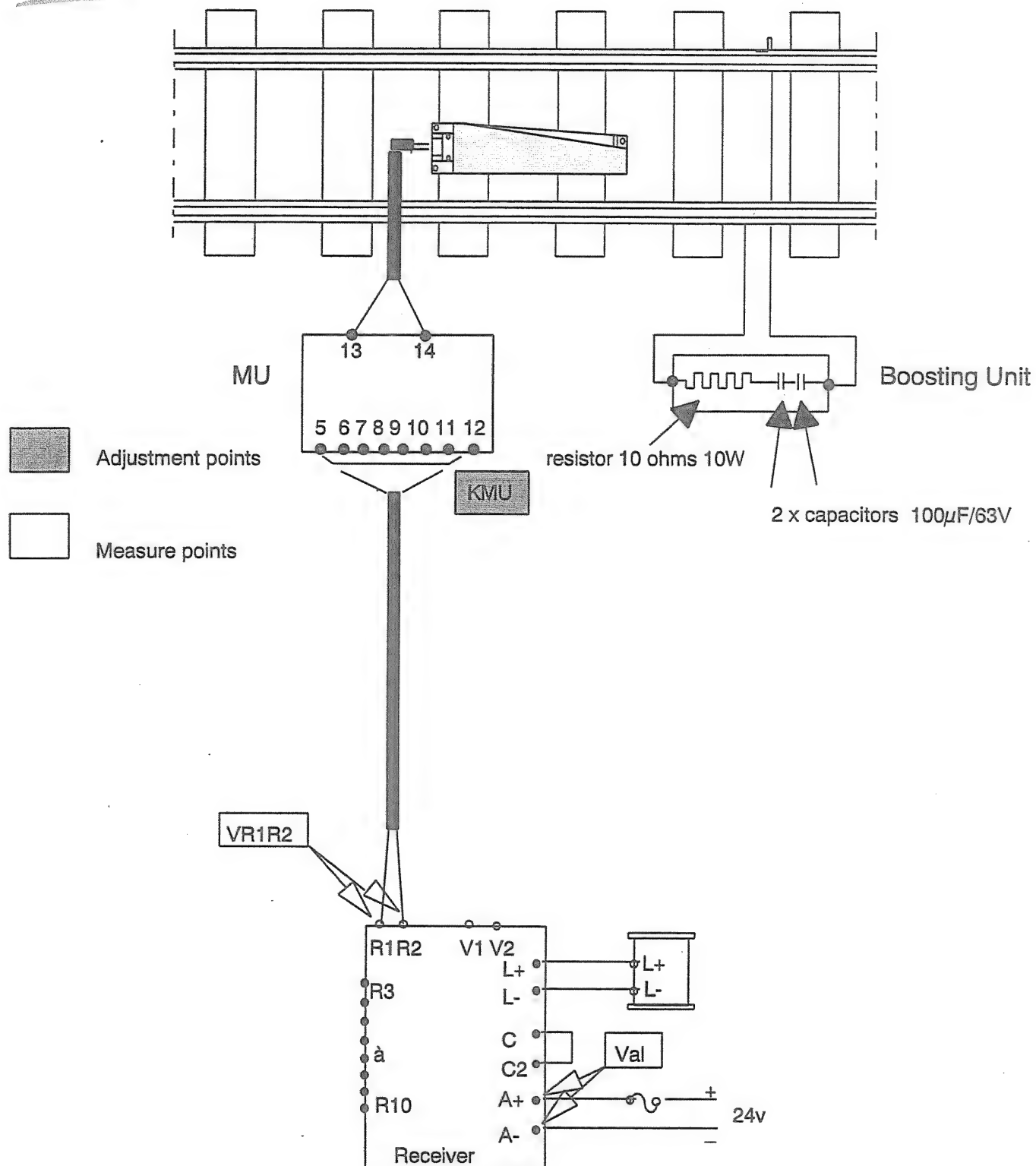


**ERECTING PLAN PPDU
DETAIL OF INSTALLATION**

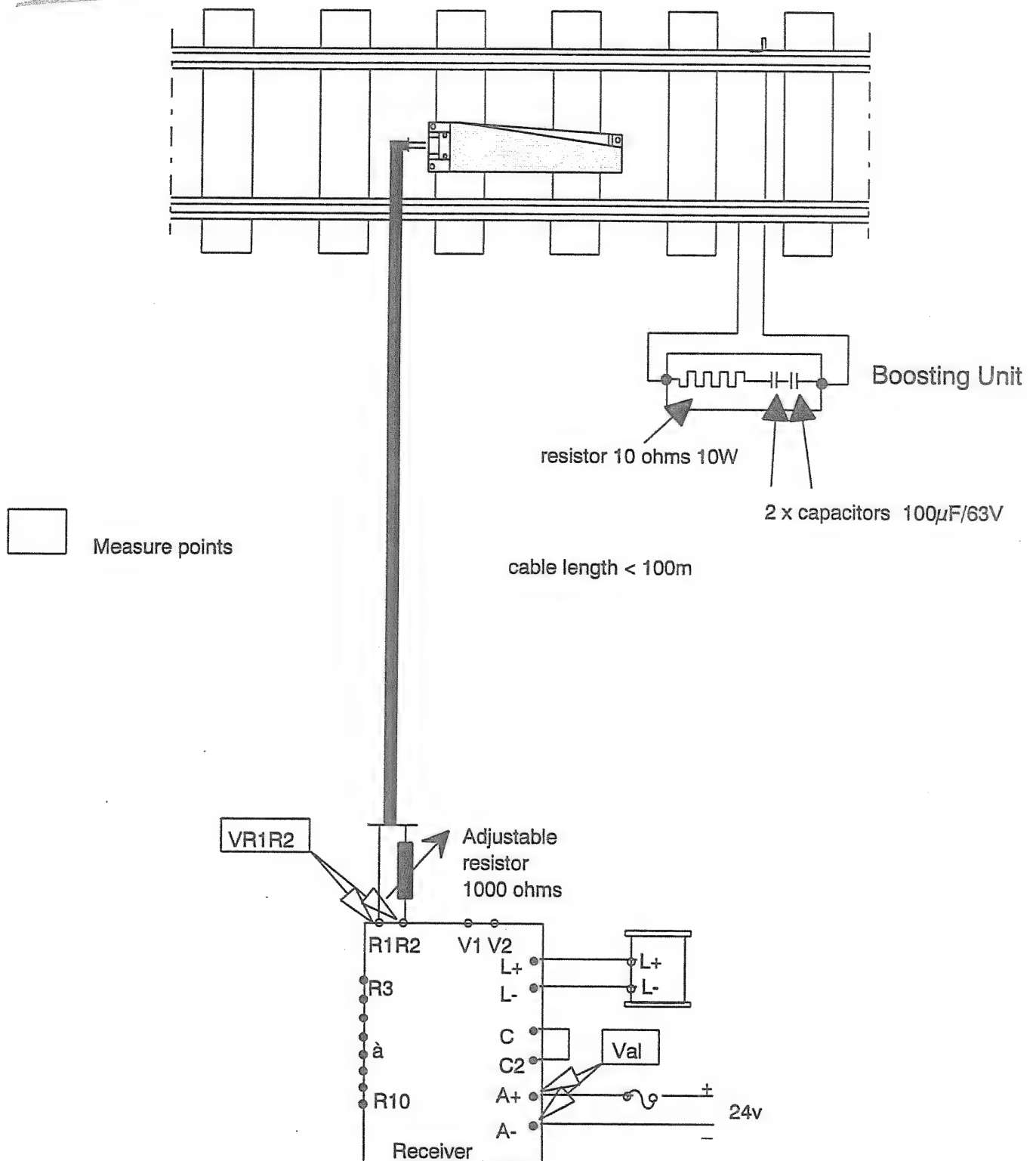
A069



INTERMEDIATE DATA COLLECTOR -IDC
Pin Point Detector - PPD



INTERMEDIATE DATA COLLECTOR (IDC)
PIN POINT DETECTOR (PPD) with MU
Cabling, measure and adjustment points



INTERMEDIATE DATA COLLECTOR (IDC)

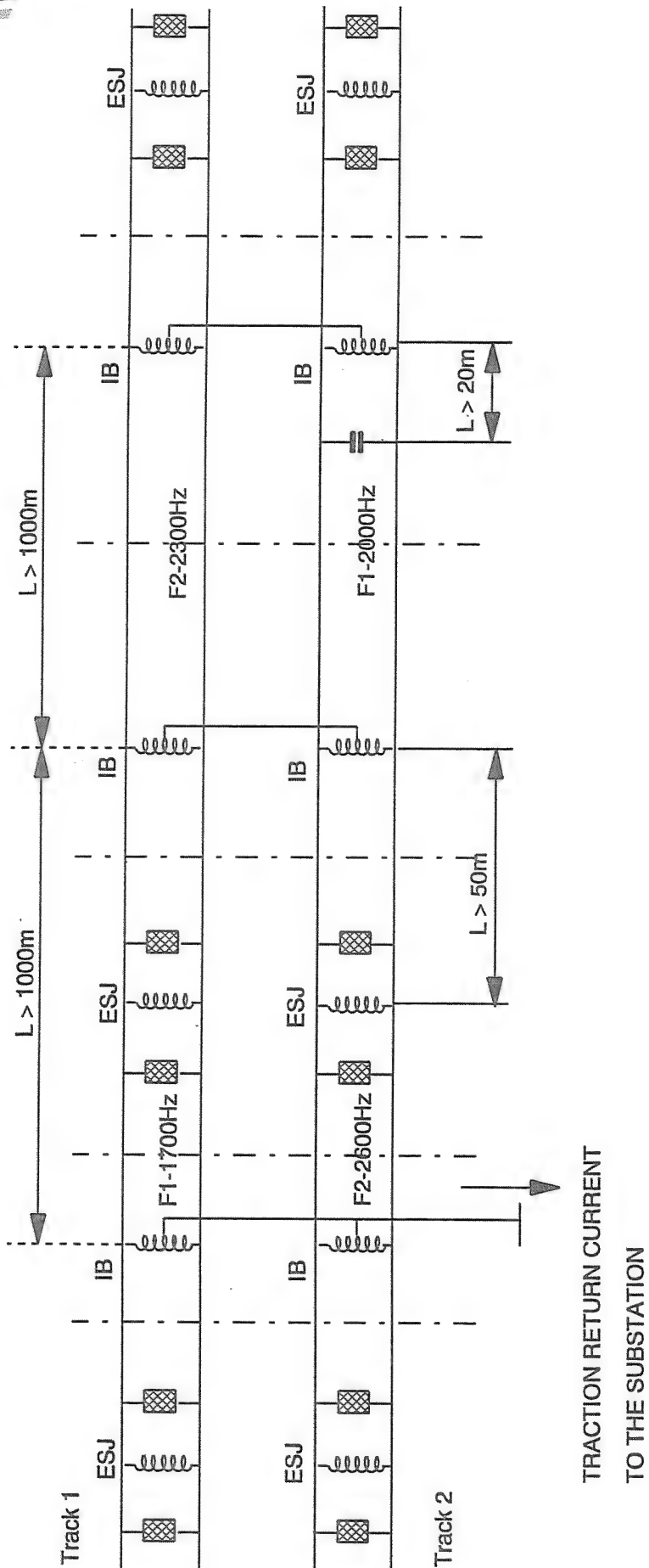
PIN POINT DETECTOR (PPD) without MU

Cabling, measure and adjustment points

A070

APPENDIX 25

UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323	1	2	
	Page 130			



APPENDIX 26

UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323	1	2	.
	Page 131			

ELTEL LIGHTNING ARRESTER

UM 71 Track circuit installation manual		1	2	

SELECTING MULTIPLE SURGE ARRESTER

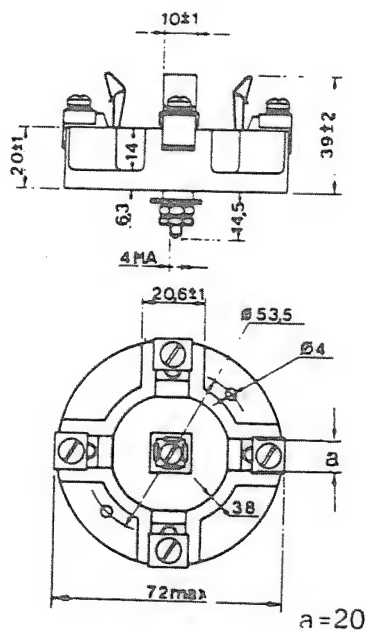
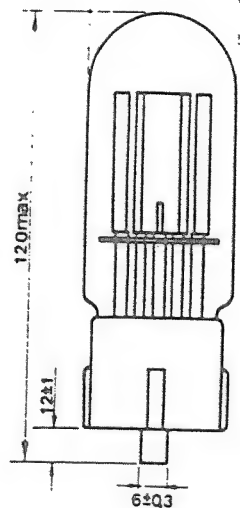
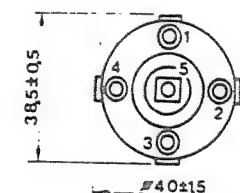
model SNCF 7960 0727 120 A 500 V

Breakdown voltage at 50 Hz (r.m.s. value) ⁰		500 V \pm 20%
Surge breakdown time lag with 1/50 waveform and 2kV peak voltage		<1 μ s
Nominal discharge current (for 4 s. max) ⁰⁰		120 A
Arc voltage (r.m.s. value) for a total discharge current at 50Hz of: ⁰⁰	4 A	\leq 40 V
	10 A	\leq 25 V
	120 A	\leq 6 V
Line to earth electrode capacitance		\leq 5,5 pF
Line to line electrode capacitance		\leq 4 pF
Isolation resistance		\geq 20,000 M Ω
Current maximum ratings of surge arrester	with 50Hz alternating current	10 discharges of 120 A ⁰⁰ lasting 1s. every 3mn.
	with 10/20 waveform	50 strokes of 5kA every 3 mn.

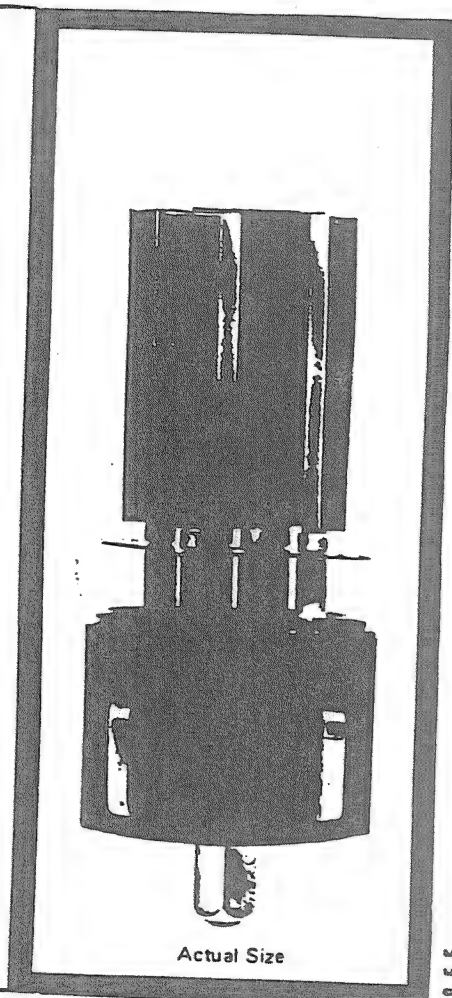
⁰ Measured with 2 opposite line electrodes in parallel

⁰⁰ Equally distributed on the 4 line electrodes

MECHANICAL DATA - Dimensions in mm



Standard Socket
7 960 0352



855

Electronix

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TRANSIENT VOLTAGE SUPPRESSOR

MODEL 1.5KE200

UM 71 track circuit installation manual		1	2	



**General
Semiconductor
Industries, Inc.**

SQUARE D COMPANY

**TRANSZORB®
TRANSIENT VOLTAGE
SUPPRESSORS**

1N6267 15KE6.8
THRU THRU
1N6303A 15KE400A

FEATURES

- 1500 watts Peak Pulse Power dissipation
- Fast Response
- Available in ranges from 6.8 to 400 volts
- Bipolar types available
- UL Recognized (e.g. 15KE200CA and 15KE220CA)
- Each device 100% tested

MAXIMUM RATINGS

- 1500 Watts of Peak Pulse Power dissipation at 25°C
- Operating and Storage temperatures: -65° to +175°C
- Forward surge current 200A, 1/120 sec half cycle @ 25°C (Unidirectional only)
- Steady State power dissipation: 5.0 watts at $T_L = 75^\circ\text{C}$, Lead Length = $\frac{3}{8}$ "

MECHANICAL CHARACTERISTICS

- Molded Case
- Weight: 1.5 grams (approximate)
- Positive terminal marked with band (unidirectional only)
- Body marked with Logo "S" and type number

APPLICATION

This series of Silicon Transient Suppressors is used in applications where large voltage transients can permanently damage voltage-sensitive components.

The TransZorb® diode can be used in applications where induced lightning on rural or remote transmission lines presents a hazard to electronic circuitry (ref: R.E.A. specification P.E. 60).

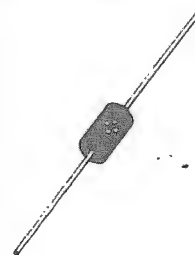
DESCRIPTION

This TransZorb diode has a peak pulse power rating of 1500 watts for one millisecond. The response time of TransZorb diode clamping action is theoretically instantaneous (1×10^{-12} sec); therefore, they can protect Integrated Circuits, MOS devices, Hybrids, and other voltage-sensitive semiconductors and components. TransZorb diodes can also be used in series or parallel to increase the peak power ratings.

ELECTRICAL CHARACTERISTICS

Clamping Factor: 1.33 at full rated power
1.20 at 50% rated power
Clamping Factor: The ratio of the actual V_C (Clamping Voltage) to the BV (Breakdown Voltage) as measured on a specific device

CASE 1



CASE OUTLINE

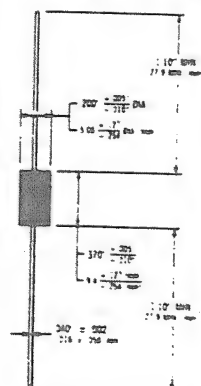


FIGURE 1—Peak Pulse Power vs. Pulse Time

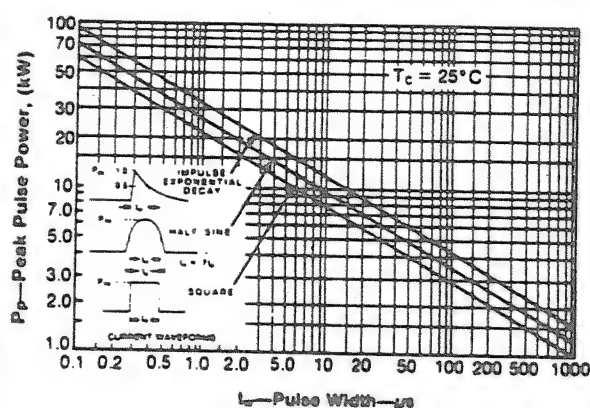
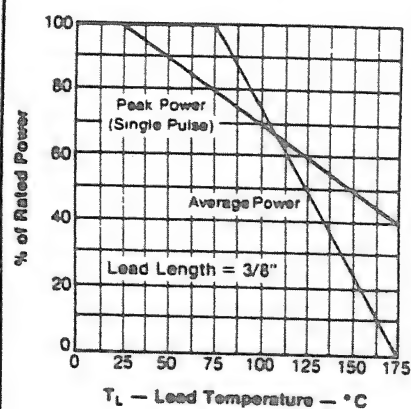


FIGURE 2—Power Derating



ELECTRICAL CHARACTERISTICS : 25 °C									
JEEC TYPE NUMBER	GENERAL DESCRIPTION PART NUMBER (NOTE 1)	REVERSE STAND-OFF VOLTAGE V _{SR} VOLTS	BREAKDOWN VOLTAGE V _{BR} VOLTS	REVERSE LEAKAGE I _R nA	MAXIMUM REVERSE LEAKAGE I _R nA (NOTE 2)	PEAK PULSE CURRENT I _{PP} mA	PEAK PULSE POWER P _P W	REVERSE VOLTAGE TEMPERATURE VARIATION OF V _{SR} mV/°C	
1N6267	1.5KE6.8	6.8	6.12 - 7.48	10	1000	10.0	10.0	5.0	
1N6267A	1.5KE6.8A*	6.8	6.45 - 7.14	10	1000	10.0	10.0	5.0	
1N6268	1.5KE7.5	7.5	6.75 - 8.25	10	500	11.7	10.0	5.0	
1N6268A	1.5KE7.5A	7.5	7.13 - 7.88	10	500	11.2	10.0	5.0	
1N6269	1.5KE8.2	8.2	7.38 - 9.02	10	200	12.5	10.0	6.0	
1N6269A	1.5KE8.2A	8.2	7.79 - 8.61	10	200	12.1	10.0	6.0	
1N6270	1.5KE9.1	9.1	8.19 - 10.00	1	50	13.0	10.0	7.0	
1N6270A	1.5KE9.1A	9.1	8.65 - 9.55	1	50	12.6	10.0	7.0	
1N6271	1.5KE10	10	9.00 - 11.00	1	10	13.5	10.0	8.0	
1N6271A	1.5KE10A	10	9.50 - 10.50	1	10	13.1	10.0	8.0	
1N6272	1.5KE11	11	9.90 - 12.10	1	5	14.0	10.0	9.0	
1N6272A	1.5KE11A	11	10.50 - 11.60	1	5	13.6	10.0	9.0	
1N6273	1.5KE12	12	10.80 - 13.20	1	5	14.5	10.0	10	
1N6273A	1.5KE12A	12	11.40 - 12.60	1	5	14.1	10.0	10	
1N6274	1.5KE13	13	11.70 - 14.30	1	5	15.0	10.0	11	
1N6274A	1.5KE13A	13	12.40 - 13.70	1	5	14.6	10.0	11	
1N6275	1.5KE15	15	13.50 - 16.50	1	5	16.0	10.0	13	
1N6275A	1.5KE15A	15	14.30 - 15.60	1	5	15.6	10.0	12	
1N6276	1.5KE16	16	14.40 - 17.60	1	5	16.5	10.0	16	
1N6276A	1.5KE16A	16	15.20 - 16.80	1	5	16.1	10.0	14	
1N6277	1.5KE18	18	16.20 - 19.80	1	5	18.0	10.0	17	
1N6277A	1.5KE18A	18	17.10 - 18.90	1	5	17.6	10.0	15	
1N6278	1.5KE20	20	18.00 - 22.00	1	5	19.0	10.0	20	
1N6278A	1.5KE20A	20	19.00 - 21.00	1	5	18.6	10.0	19	
1N6279	1.5KE22	22	19.80 - 24.20	1	5	20.0	10.0	21	
1N6279A	1.5KE22A	22	20.90 - 23.10	1	5	20.6	10.0	20	
1N6280	1.5KE24	24	21.60 - 26.40	1	5	21.7	10.0	25	
1N6280A	1.5KE24A	24	22.80 - 25.20	1	5	21.3	10.0	23	
1N6281	1.5KE27	27	24.30 - 29.70	1	5	23.1	10.0	28	
1N6281A	1.5KE27A	27	25.70 - 28.30	1	5	22.7	10.0	25	
1N6282	1.5KE30	30	27.00 - 33.00	1	5	24.6	10.0	31	
1N6282A	1.5KE30A	30	28.50 - 31.50	1	5	24.2	10.0	28	
1N6283	1.5KE33	33	29.70 - 36.30	1	5	26.7	10.0	31	
1N6283A	1.5KE33A	33	31.40 - 34.70	1	5	26.3	10.0	30	
1N6284	1.5KE36	36	32.40 - 39.60	1	5	28.0	10.0	35	
1N6284A	1.5KE36A	36	34.20 - 37.80	1	5	27.6	10.0	31	
1N6285	1.5KE40	40	35.10 - 43.90	1	5	29.4	10.0	39	
1N6285A	1.5KE40A	40	37.10 - 41.00	1	5	29.0	10.0	30	
1N6286	1.5KE43	43	36.70 - 47.30	1	5	30.0	10.0	46	
1N6286A	1.5KE43A	43	40.90 - 45.20	1	5	30.6	10.0	36	
1N6287	1.5KE47	47	42.30 - 51.70	1	5	31.8	10.0	50	
1N6287A	1.5KE47A	47	44.70 - 49.30	1	5	31.4	10.0	48	
1N6288	1.5KE51	51	45.90 - 56.10	1	5	33.0	10.0	55	
1N6288A	1.5KE51A	51	48.50 - 53.60	1	5	32.6	10.0	51	
1N6289	1.5KE56	56	50.40 - 61.60	1	5	34.5	10.0	58	
1N6289A	1.5KE56A	56	53.20 - 58.80	1	5	34.1	10.0	56	
1N6290	1.5KE62	62	55.80 - 68.20	1	5	36.0	10.0	65	
1N6290A	1.5KE62A	62	58.90 - 65.10	1	5	35.6	10.0	62	
1N6291	1.5KE68	68	61.20 - 74.80	1	5	37.8	10.0	71	
1N6291A	1.5KE68A	68	64.60 - 71.40	1	5	37.4	10.0	69	
1N6292	1.5KE75	75	67.50 - 82.50	1	5	39.0	10.0	80	
1N6292A	1.5KE75A	75	71.30 - 78.80	1	5	38.6	10.0	76	
1N6293	1.5KE82	82	73.80 - 90.20	1	5	40.6	10.0	86	
1N6293A	1.5KE82A	82	77.90 - 86.10	1	5	40.2	10.0	85	
1N6294	1.5KE91	91	81.90 - 100.00	1	5	42.6	10.0	99	
1N6294A	1.5KE91A	91	86.50 - 95.50	1	5	42.2	10.0	94	
1N6295	1.5KE100	100	90.00 - 110.00	1	5	44.0	10.0	109	
1N6295A	1.5KE100A	100	95.00 - 105.00	1	5	43.6	10.0	104	
1N6296	1.5KE110	110	99.00 - 121.00	1	5	45.0	10.0	120	
1N6296A	1.5KE110A	110	105.00 - 116.00	1	5	44.6	10.0	115	
1N6297	1.5KE120	120	108.00 - 132.00	1	5	46.0	10.0	131	
1N6297A	1.5KE120A	120	114.00 - 126.00	1	5	45.6	10.0	125	
1N6298	1.5KE130	130	117.00 - 143.00	1	5	47.0	10.0	142	
1N6298A	1.5KE130A	130	124.00 - 137.00	1	5	46.6	10.0	136	
1N6299	1.5KE150	150	135.00 - 165.00	1	5	49.0	10.0	164	
1N6299A	1.5KE150A	150	143.00 - 158.00	1	5	48.6	10.0	157	
1N6300	1.5KE160	160	144.00 - 176.00	1	5	50.0	10.0	175	
1N6300A	1.5KE160A	160	152.00 - 168.00	1	5	49.6	10.0	167	
1N6301	1.5KE170	170	153.00 - 187.00	1	5	51.0	10.0	186	
1N6301A	1.5KE170A	170	162.00 - 179.00	1	5	50.6	10.0	180	
1N6302	1.5KE180	180	162.00 - 198.00	1	5	52.0	10.0	197	
1N6302A	1.5KE180A	180	171.00 - 189.00	1	5	51.6	10.0	188	
1N6303	1.5KE200	200	180.00 - 220.00	1	5	54.0	10.0	219	
1N6303A	1.5KE200A	200	190.00 - 210.00	1	5	53.6	10.0	209	
	1.5KE220	220	198.00 - 242.00	1	5	56.0	10.0	240	
	1.5KE220A	220	209.00 - 231.00	1	5	55.6	10.0	230	
	1.5KE250	250	225.00 - 275.00	1	5	59.0	10.0	270	
	1.5KE250A	250	237.00 - 263.00	1	5	58.6	10.0	260	
	1.5KE300	300	270.00 - 330.00	1	5	63.0	10.0	330	
	1.5KE300A	300	285.00 - 315.00	1	5	62.6	10.0	315	
	1.5KE350	350	315.00 - 385.00	1	5	69.0	10.0	385	
	1.5KE350A	350	333.00 - 368.00	1	5	68.6	10.0	368	
	1.5KE400	400	360.00 - 440.00	1	5	74.0	10.0	440	
	1.5KE400A	400	380.00 - 420.00	1	5	73.6	10.0	420	

* UL listed 1.5KE200CA and 1.5KE220CA. Not available as bipolar.

TRANSZORB
UNIPOLAR & BIPOLAR
1N6267 1.5KE6.8
THRU
1N6303A 1.5KE400A

TRANSZORB
VOLTAGE
SUPPRESSORS

1

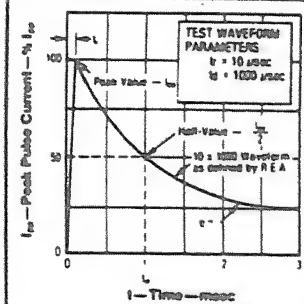
ABBREVIATIONS & SYMBOLS

- V_S Stand-Off Voltage Applied Reverse Voltage to assure a nonconductive condition. (See Note 2)
- V_{BR} Breakdown Voltage
- V_{CLAMP} Maximum Clamping Voltage The maximum peak voltage appearing across the TransZorb suppressor when subjected to the peak pulse current in a one millisecond time interval. The peak pulse voltage is the sum of a voltage rise due to diode series resistance and an increase in breakdown voltage caused by the junction temperature rise.
- I_{PP} Peak Pulse Current—See Figure 3
- P_P Peak Pulse Power
- I_R Reverse Leakage
- ΔV_C Rise in voltage above the breakdown voltage caused by current flow

NOTES

- Part numbers shown are for unipolar devices. Add C or CA suffix to specify bipolar suppressors. 1.5KE6.8 is available as unipolar only.
- A TransZorb suppressor is normally selected according to the reverse Stand-Off Voltage, V_S, which should be slightly greater than the maximum DC or continuous peak operating voltage level.
- For bipolar types having V_S of 10 volts and under, the limit is doubled.
- For unipolar diodes V_{CLAMP} 3.5V at I_{PP} 100A, 1.2 sine wave of 8.33ms pulse width.

FIGURE 3—Pulse Waveform

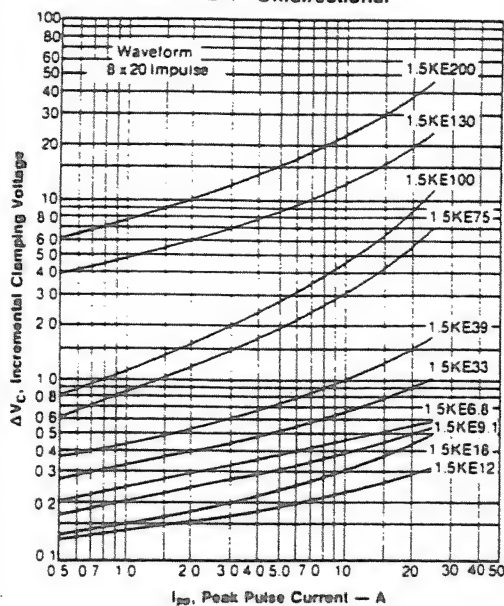


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CLAMPING VOLTAGE 8 x 20 IMPULSE

$$\Delta V_c = V_c - V_{BR}$$

FIGURE 4—Unidirectional



CLAMPING VOLTAGE 10 x 1000 IMPULSE

$$\Delta V_c = V_c - V_{BR}$$

FIGURE 5—Unidirectional

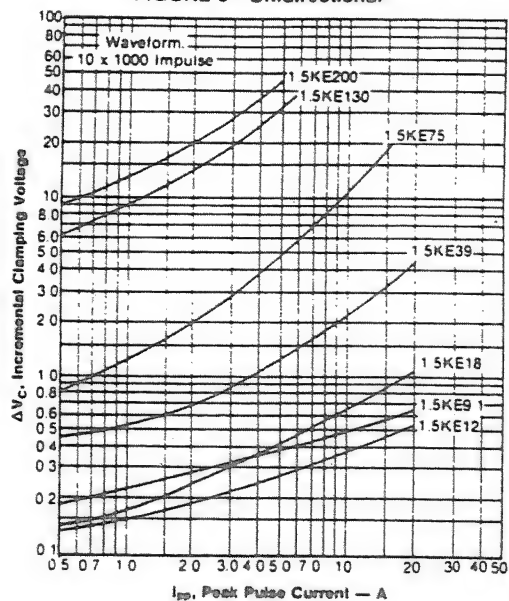


FIGURE 6—Bidirectional

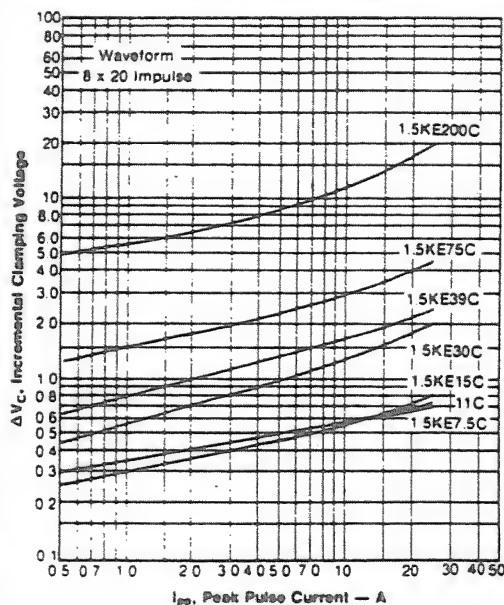
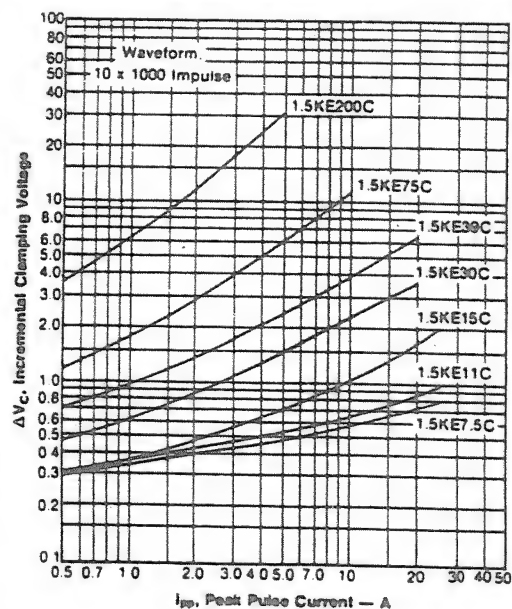


FIGURE 7—Bidirectional



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TYPICAL ELECTRICAL CHARACTERISTICS

FIGURE 8—Capacitance

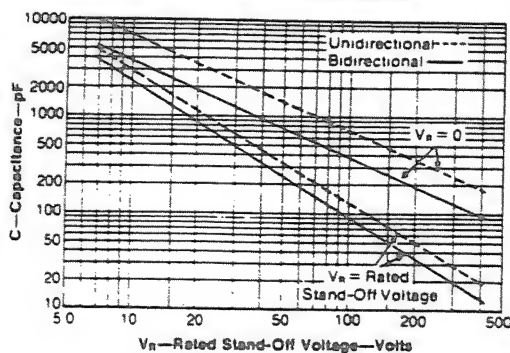


FIGURE 9—Forward Voltage

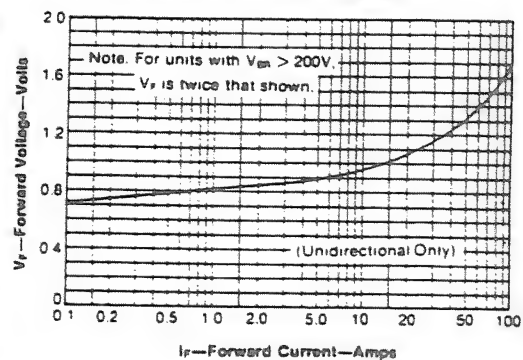


FIGURE 10—Model Parameters

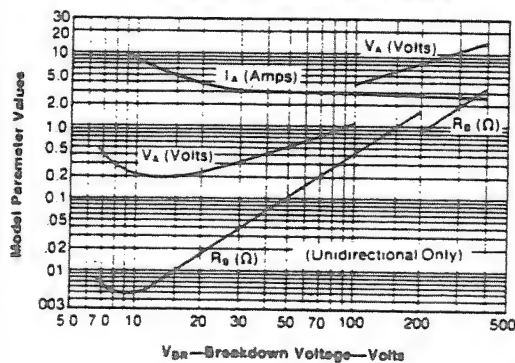


FIGURE 11
Breakdown Voltage Temperature Coefficient

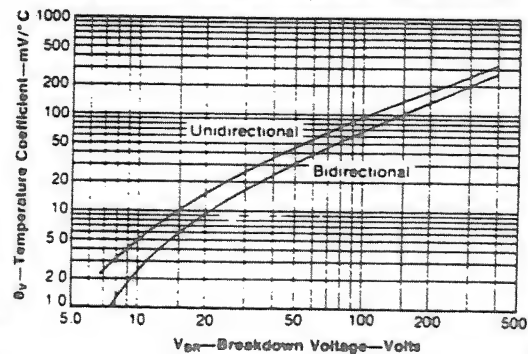
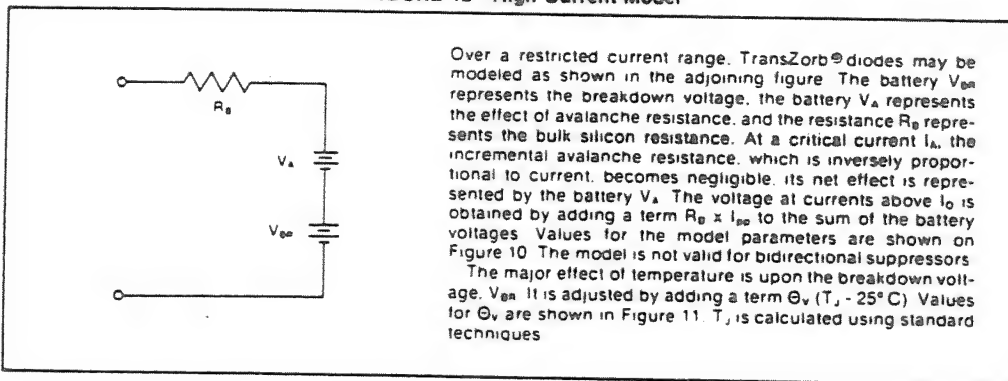


FIGURE 12—High Current Model



General Semiconductor Industries, Inc.
SC-8810 Diodes

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TRANSIENT VOLTAGE SUPPRESSOR

MODEL V130LA20A

UM 71 track circuit installation manual

1

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GE-Metal-Oxide Varistors

GE has been helping customers solve transient voltage problems since the introduction of GE-MOV® varistors in 1972. The GE-MOV® team is constantly researching the causes and effects of transients and developing new solutions to meet all types of transient suppression needs; committed to innovation beyond today's technology.

As the field of electronics has grown rapidly through the use of solid-state components, so have the applications for surge suppressors to protect these transient-sensitive devices. Innovations such as surface-mount technology have also altered the demand profile by adding packaging considerations to functional ones.

As a result of innovation and research, the GE-MOV® line of metal-oxide varistors has expanded to include surface-mount devices, new high-energy packages, connector-pin varistors, and high-temperature, low-profile varistors. These new products supplement the GE-MOV® line of radial, axial, and high-energy packaged varistors, already the broadest in the industry.

GE-MOV® Specification Guide

CH	13
SM	14, 15
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GE-MOV® Features

FAMILY FEATURES:

- Wide Voltage/Energy Range
- Excellent Clamp Ratio
- Power
- No Follow-On Current
- Fast Response Time
- Low Standby
- UL Recognized

TYPE FEATURES:

CH/SM Series

Surface Mount Varistors

- Better Performance
- Higher Reliability
- Lower Equipment Cost
- Saves on Board Height/Bulk/Weight

CP Series

Connector Pin Varistors

- Provides transient protection in connectors
- Available in 22, 20, and 16 gauge sizes

MA Series

- Axial Package
- Wide Voltage Range
- Automatic Insertion

ZA Series

- Radial Package
- Low Voltage Operation

LA Series

- Radial Package
- Line Voltage Operation
- UL Recognized

RA Series

- Low Profile
- High Temperature Capability
- Precise Seating Plane
- In-Line Leads

PA Series

- Rigid Mountdown
- NEMA Creep and Strike Distance
- Quick Connect Terminal
- UL Recognized

DA, DB, BA, BB Series

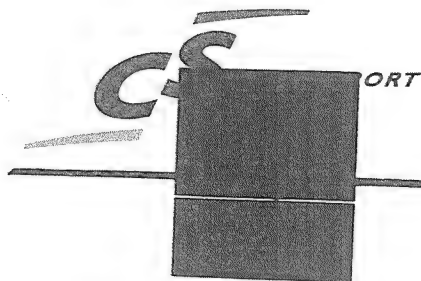
- High Energy Capability
- Rigid Terminals
- Isolated
- Low Inductance
- Improved Creep and Strike
- UL Recognized

CA Series

- Industrial Discs

HI Reliability Series

- 100% Prescreened
- 100% Process Conditioning
- Meets Military Specifications



Concepts of Transient Voltage Protection

Varistor characteristics are measured at high current and energy levels of necessity with an impulse waveform. Shown below is the ANSI STD C62.1 waveshape, an exponentially decaying waveform representative of lightning surges, and the discharge of stored energy in reactive circuits. See Figures 1 and 2.

Based on industry practices, the 8/20 μ s current wave (8 μ s rise and 20 μ s to 50% decay of peak value) is used as a standard for current (I_m) and clamp voltage (V_c) ratings shown in the specification tables and curves. Ratings for other waves of different decay times are shown specifically on the pulse life derating curves.

For the energy rating (W_m), a longer duration waveform of 10/1000 μ s is used. This condition is more representative of the high energy surges usually experienced from inductive discharge of motors and transformers. GE-MOV® Varistors are rated for a maximum pulse energy surge that results in a varistor voltage (V_{Nidec}) shift of less than $\pm (10\% + IV)$ of initial value.

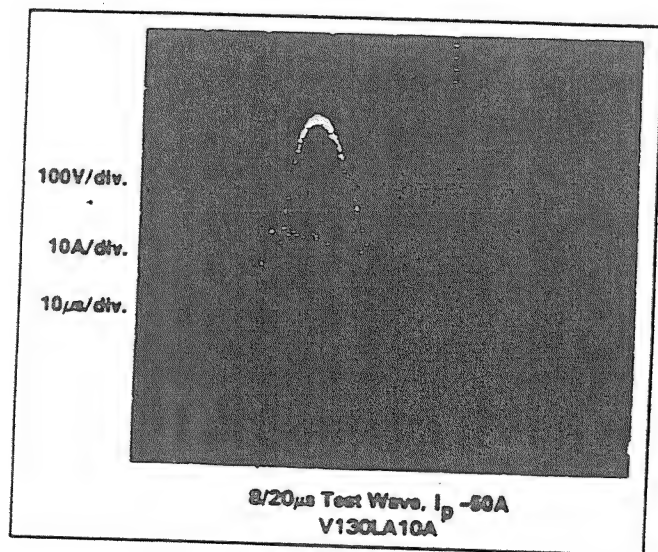


Figure 1

Varistor Safety Precautions

Should the varistor be subjected to surge currents and energy levels substantially above maximum ratings, it may physically fail by package rupture or expulsion of material. It is recommended that protective fusing be used as described in the Transient Voltage Suppression Manual 400.3 10/86 5th Edition. If not fused, the varistor should be located away from other components or be physically shielded from them.

GE-MOV® Varistor encapsulant complies with flammability requirements of Underwriters Laboratories Standard UL 1414.

To determine the energy absorbed in a varistor the following equation applies:

$$E = KV_c I \tau$$

where I is the peak current applied, V_c is the clamp voltage which results, τ is the pulse width and K is a constant. K values are 1.0 for a rectangular wave, 1.4 for a 10/1000 μ s wave, and 1.0 for a 8/20 μ s wave.

Note that the rated energy (W_m) and the energy absorbed in a varistor may not be identical. A specimen with lower clamping voltage will absorb less energy. This effect tends to be greatest at rated peak current (I_m) with an 8/20 μ s wave.

It is important to note, as demonstrated by the above equation, that poorer varistors must absorb higher energy levels than the better performance varistors with lower clamp voltages, yet they actually provide less over-voltage protection. For that reason, energy ratings based on an 8/20 μ s pulse tend to overstate varistor capability. The 10/1000 μ s waveform consequently gives a more realistic energy rating value.

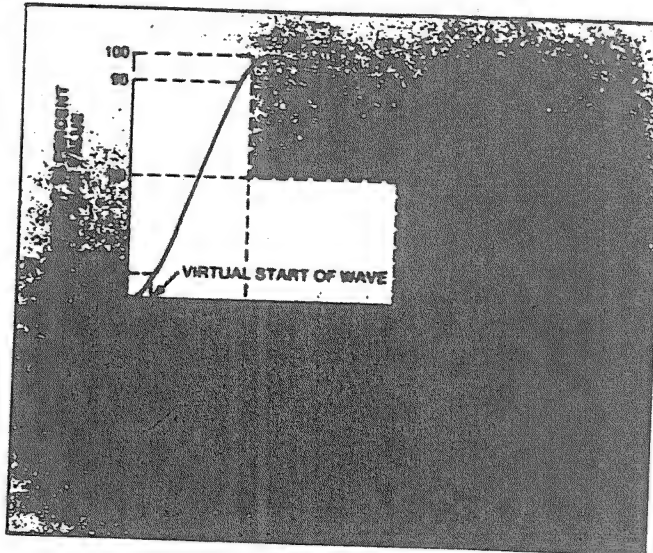


Figure 2

Speed of Response

The measured response time of a varistor is influenced by lead configuration and length. In a typical application, the response time is shorter than the inductive lead effect. In a coaxial configuration, one could show response times of less than a few nanoseconds.

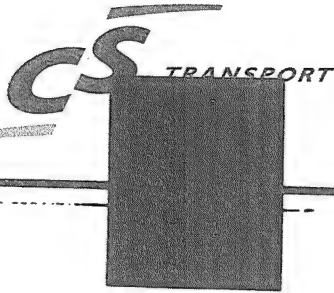








Table 1 — Term Definitions

Term	
DC Voltage, $V_{(dc)}$	Maximum allowable steady state dc applied voltage, DC standby current, $I_D = 20\mu A$ typical, $200\mu A$ maximum at $T_A = 25^\circ C$, except V18ZA to V36ZA 20mm size: $I_D = 200\mu A$ (TYP), 3mA max.
RMS Voltage, $V_{(rms)}$	Maximum allowable steady state sinusoidal voltage (RMS) at 50-60Hz. If a nonsinusoidal waveform is applied, the recurrent peak voltage should be limited to $\sqrt{2}V_{(rms)}$.
Energy, W_{em}	Maximum allowable energy for a single impulse of 10/1000 μs current waveform. Energy rating based on a V_N shift of less than $\pm 10\%$, $\pm 1V$ of initial value.
Peak Current, I_m	Maximum allowable peak current for a single impulse of 8/20 μs waveform with rated continuous voltage applied.
Varistor Voltage, V_{max}	Varistor peak terminal voltage measured with a specified current applied. For dc conditions, 1mA is applied for a duration of 20ms to 5s. For ac conditions 1mA peak 60Hz wave is applied.
	Maximum terminal voltage measured with an applied 8/20 μs impulse of a given peak current. See characteristic tables for product ratings of clamping voltage over the allowable range of peak impulse current starting on page 13.
	Typical values measured at a test frequency of 1.0 MHz. Maximum capacitance can be 100% higher than the typical value measured at 1.0 MHz.

Table 2 — Varistor Product Family Selection Guide

		VOLTS AC RMS													
		4	10	25	130	150	250	275	660	750	1000	2000			
		VOLTS DC													
		5.5	14	35	175	200	330	360	850	970	1200	3500			
250-500	1.5-5.0												22, 20 16 GAUGE		
100-6500	0.4-160												5x8	10x16	14x22mm
40-100	0.07-1.7														
25-4500	0.1-35												3mm		
25-6500	0.4-160												5 7 10 14 20mm		
1200-6500	11-300												  		
6500	70-250												7 10 14 20mm		
30,000-40,000	270-1050												20mm		
50,000-70,000	450-10,000												40mm 40mm		
20,000-70,000	200-10,000												60mm		
		32, 40, 60mm													

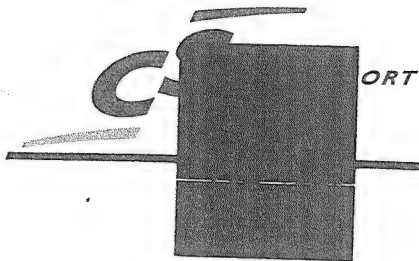


Table 3 — Family Characteristics

Operating Ambient Temperature (w/out derating)	-55 to +85°C	-55 to +85°C	-55 to +125°C	-55 to +85°C	-55 to +85°C	-40 to +85°C*	-55 to +85°C	-55 to +75°C	-55 to +75°C
Storage Temperature	-55 to +200°C	-55 to +150°C	-55 to +200°C	-55 to +125°C	-55 to +150°C	-40 to +125°C	-55 to +125°C	-55 to +125°C	-55 to +125°C
† HiPot Encapsulation, Volts dc For 1 Minute	NA	2500	NA	2500	1000	NA	5000	5000	NA
Voltage Temperature Coefficient (Vc at Specified Test Current)	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C	<.01%/°C
Insulation Resistance (MΩ)	NA	>1000	NA	>1000	>1000	NA	>1000	>1000	NA

*Base Plate Temperature.

Solderability: Per MIL STD 202E, Method 208C.

†Dielectric withstand per MIL STD 202, Method 301, 2500Vdc min.

Table 4 — Surge Voltages and Currents Deemed to Represent the Indoor Environment and Recommended for Use in Designing Protective Systems

A. Long branch circuits and outlets	II	0.5μs - 100kHz	6kV 200A	High impedance(1) Low impedance(2)	(120V System) — 0.8	(240V System) — 1.6
B. Major feeders short branch circuits, and load center	III	1.2/50μs 8/20μs	6kV 3kA	High impedance(1) Low impedance(2)	— 40	— 80
		0.5μs - 100kHz	6kV 500A	High impedance(1) Low impedance	— 2	— 4

- Notes: (1) For high-impedance test specimens or load circuits, the voltage shown represents the surge voltage. In making simulation tests, use that value for the open-circuit voltage of the test generator.
 (2) For low-impedance test specimens or load circuits, the current shown represents the discharge current of the surge (not the short-circuit current of the power system). In making simulation tests, use that current for the short-circuit current of the test generator.
 (3) Other suppressors which have different clamping voltages would receive different energy levels.

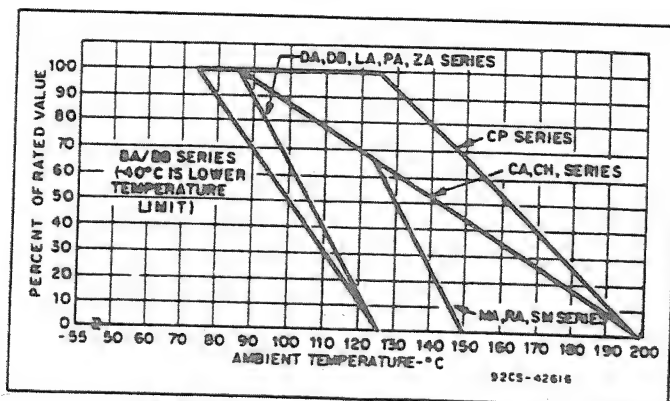


Figure 3 — Current Power, Energy Rating vs. Temperature

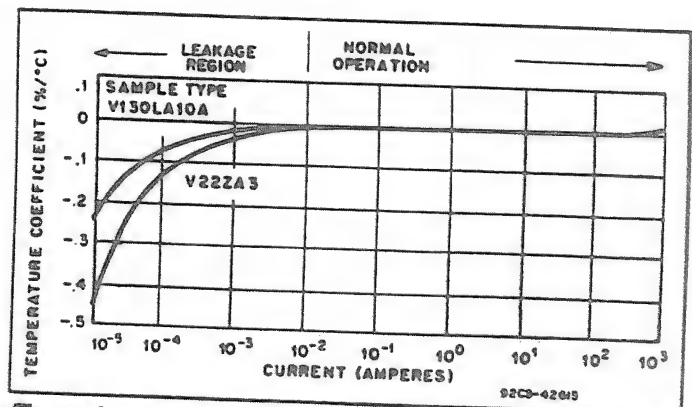


Figure 4 — Typical Temperature Coefficient of Voltage Versus Current 14mm Size, -55 to +125°C

LA SERIES Ratings and Characteristics (Cont'd)

Series LA Varistors are listed under UL file #E75961 and E56529 as a recognized component.

7, 10, 14, 20mm

Model Number	Model Size Disc Dia. (mm)	Device Marking	Maximum Ratings (RVC)										
			Continuous Ratings										
			Rated Voltage	AC Voltage	Energy Rating	Leakage Current	Min.	V _{mca}	Max.	V _c	I _a	f=1 MHz	
			Volts	Volts	Joules	Amps	Volts	Volts	Volts	Volts	Amps	Picofarads	
V130LA1	7	1301	130	175	11	1200	184	200	255	390	10	180	
V130LA2	7	1302	130	175	11	1200	184	200	228	340	10	180	
V130LA5	10	1305	130	175	20	2500	184	200	228	340	25	450	
V130LA10A	14	130L10	130	175	38	4500	184	200	228	340	50	1000	
V130LA20A	20	130L20	130	175	70	6500	184	200	228	340	100	1900	
V130LA20B	20	130L20B	130	175	70	6500	184	200	220	325	100	1900	
V140LA2	7	1402	140	180	12	1200	198	220	242	360	10	160	
V140LA5	10	1405	140	180	22	2500	198	220	242	360	25	400	
V140LA10A	14	140L10	140	180	42	4500	198	220	242	360	50	900	
V150LA1	7	1501	150	200	13	1200	212	240	284	430	10	150	
V150LA2	7	1502	150	200	13	1200	212	240	268	395	10	150	
V150LA5	10	1505	150	200	25	2500	212	240	268	395	25	360	
V150LA10A	14	150L10	150	200	45	4500	212	240	268	395	50	800	
V150LA20A	20	150L20	150	200	80	6500	212	240	268	395	100	1600	
V150LA20B	20	150L20B	150	200	80	6500	212	240	268	395	100	1600	
V175LA2	7	1752	175	225	15	1200	247	270	303	455	10	130	
V175LA10A	14	175L10	175	225	55	4500	247	270	303	455	50	700	
V230LA4	7	2304	230	300	20	1200	324	360	396	595	10	100	
V230LA10	10	230L	230	300	35	2500	324	360	396	595	25	250	
V230LA20A	14	230L20	230	300	70	4500	324	360	396	595	50	550	
V250LA2	7	2502	250	330	21	1200	354	390	473	730	10	90	
V250LA4	7	2504	250	330	21	1200	354	390	429	650	10	90	
V250LA10	10	250L	250	330	40	2500	354	390	429	650	25	220	
V250LA20A	14	250L20	250	330	72	4500	354	390	429	650	50	500	
V250LA40A	20	250L40	250	330	130	6500	354	390	429	650	100	1000	
V250LA40B	20	250L40B	250	330	130	6500	354	390	413	620	100	1000	
V275LA2	7	2752	275	369	23	1200	389	430	515	775	10	80	
V275LA4	7	2754	275	369	23	1200	389	430	473	710	10	80	
V275LA10	10	275L	275	369	45	2500	389	430	473	710	25	200	
V275LA20A	14	275L20	275	369	75	4500	389	430	473	710	50	450	
V275LA40A	20	275L40	275	369	140	6500	389	430	473	710	100	900	
V275LA40B	20	275L40B	275	369	140	6500	389	430	453	680	100	800	
V300LA2	7	3002	300	405	25	1200	420	470	585	870	10	70	
V300LA4	7	3004	300	405	25	1200	420	470	517	775	10	70	
V320LA20A	14	320L20	320	420	90	4500	482	510	565	880	50	380	
V320LA40B	20	320L40	320	420	160	6500	482	510	540	810	100	750	
V420LA10	10	420L	420	560	45	2500	610	680	748	1120	25	280	
V420LA20A	14	420L20	420	560	90	4500	610	680	748	1120	50	550	
V420LA40B	20	420L40	420	560	160	6500	610	680	720	1080	100	800	
V480LA40A	14	480L40	480	640	105	4500	670	750	825	1240	50	520	
V480LA80B	20	480L80	480	640	180	6500	670	750	790	1180	100	820	
V510LA40A	14	510L40	510	675	110	4500	735	820	910	1380	50	520	
V510LA80B	20	510L80	510	675	190	6500	735	820	860	1280	100	820	
V575LA40A	14	575L40	575	730	120	4500	805	910	1000	1480	50	520	
V575LA80B	20	575L80	575	730	220	6500	805	910	980	1400	100	820	
V660LA50A	14	660L50	660	850	140	4500	940	1050	1210	1780	50	520	
V660LA100B	20	660L100	660	850	250	6500	940	1050	1100	1680	100	820	
V1000LA80A	14	1000L80	1000	1200	220	4500	1425	1600	1800	2580	50	520	
V1000LA160B	20	1000L160	1000	1200	380	6500	1425	1600	1600	2280	100	820	

NOTE: Power dissipation of transients not to exceed 0.25, 0.4, 0.6, 1.0 watts for sizes 7, 10, 14 and 20mm respectively.

SOULE LOW VOLTAGE LIGHTNING ARRESTER

UM 71 track circuit installation manual

1

2

LS LOW VOLTAGE SURGE DIVERTERS

TYPES 8134 & 8137

Low voltage distribution systems are liable to be struck by lightning, which may spread out as far as the customers installations. It is important to protect them efficiently; this can be done inexpensively with our LS surge diverters.

Advances in recent years have resulted in the development of new models with improved characteristics, but preserving their traditional outstanding robustness.

DESCRIPTION

Like the models it has superseded, the new LS non-linear resistor surge diverter is made up of a Carbosial resistor in series with a pre ionized spark-gap. This combination, maintained by a spring, is mounted inside a protective cover of brown enamelled porcelain.

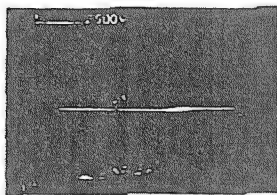
The Carbosial resistor is made up of a high temperature-baked silicon carbide binder having a stable pronounced « bend ». This disc shaped resistor has an enamelled rounded edge avoiding any risk of flashover. The surfaces are metallized so as to ensure a good contact with the components connected to the terminals.

As in the LS high-voltage surge diverters, the pre-ionized spark-gap comprises two metal discs, one convex, the other flat, separated by an insulating wedge assuring ionization of the explosive gap. The components are bound together under pressure, thus forming a closed spark-gap.

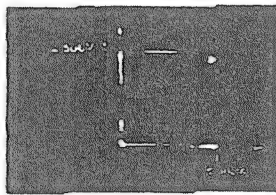
OPERATION

When a voltage surge reaches the surge diverter, the spark-gap pre-ionization is assured by the formation of peripheric discharges at a voltage well below the sparkover voltage. The sparkover therefore occurs without any appreciable time-lag, regardless of the steepness of the incident wavefront. The discharge current flows to earth via the Carbosial non-linear resistor. The latter has a resistivity value which decreases very rapidly as a function of the voltage applied to it, as shown on the U (I) characteristic. A very high current of 4 or 5 kA can thus flow to earth without the instantaneous voltage across the resistor terminals ever exceeding 2,500V.

After the surge has gone the voltage decreases and approximates to the value of the service voltage. Deionization of the Carbosial non-linear resistor is almost instantaneous. The current assumes such a small value that the follow current is practically zero and that the arc across the spark-gap extinguishes spontaneously as shown on the oscillograms U (t) and I (t).

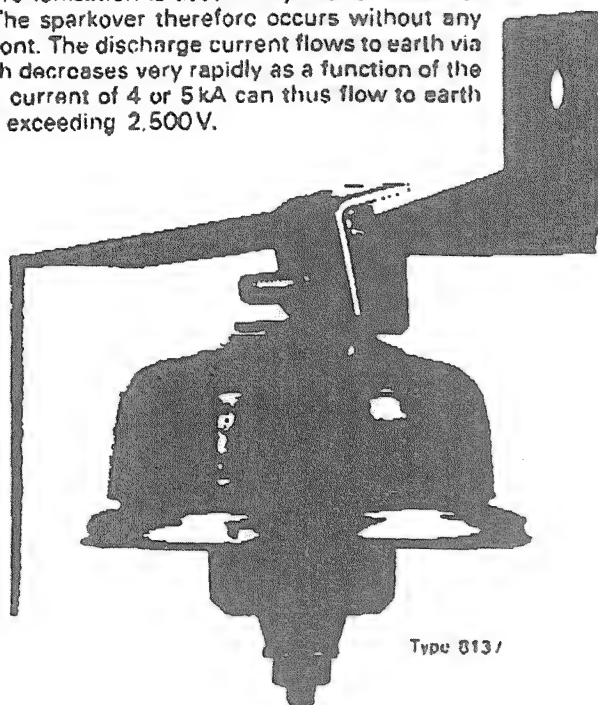


U (t) and I (t) characteristics



U (t) characteristics

Oscillograms for surge diverters LS 8134 and 8137



Type 8137

Reliability of operation is such that it has been possible to give LS surge diverters, designed for a standard maximum service voltage of 0.5 kV, the same characteristics as those of surge diverters designed for a standard voltage of 0.28 kV. We have therefore been in a position to make a single model for 0.5 kV and 0.28 kV which can be used in any low-voltage distribution system, whatever its service voltage, up to a maximum of 500 V. On the other hand, for reasons of robustness, we have given our LS low-voltage surge diverters a nominal discharge current of 5,000 A which is well in excess of that allowed for in I.E.C. standards (1,500 A).

	8134 and 8137
Surge diverter voltage rating (rescal voltage)	0.5 kV
Nominal discharge current	5 kA
Maximum front-of-wave impulse sparkover voltage	3 kV
Maximum residual voltage for nominal discharge current	2.5 kV

For rated voltages over 500 V, please consult us.

SURGE DIVERTERS 8137

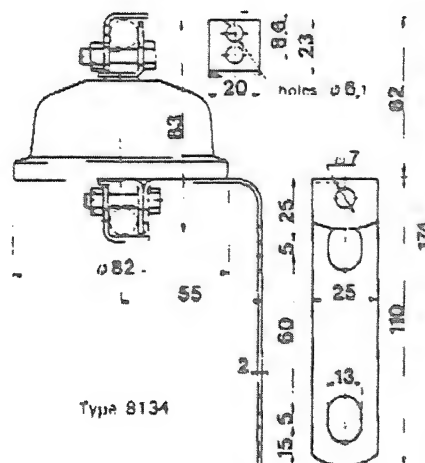
Model 8137 is identical to the 8134 except for a disconnecting device at the bottom. The purpose of the disconnecting device is to isolate the surge diverter from the earth connection in the event of a short circuit; this may be caused by an abnormal overload, and is consequently quite rare.

DESCRIPTION - OPERATION

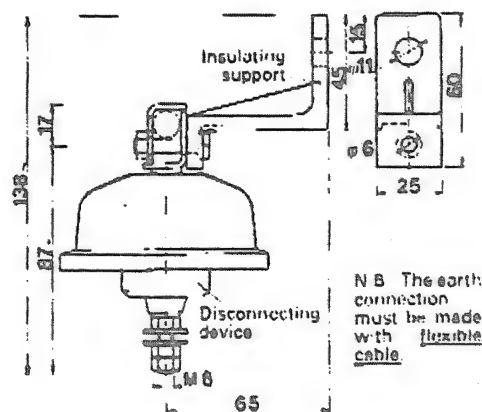
A pin connected to the earth connection is soldered to the centre of the diverter's metal flange. The pin is spring loaded, and the whole arrangement is enclosed in an insulating housing.

When the surge diverter is short-circuited, the continuous current causes progressive heating of the resistor on the metal flange. The temperature rise is transmitted to the solder which melts, releasing the spring-loaded pin connected to the earth-connection. The disconnecting device is thus ejected together with the earth-connection, which must absolutely be a flexible cable.

There is no outward evidence of operation apart from the fall of the earth connection, the advantage of which is that the surge diverter can easily be identified after it has been automatically disconnected by an overload.



Type 8134

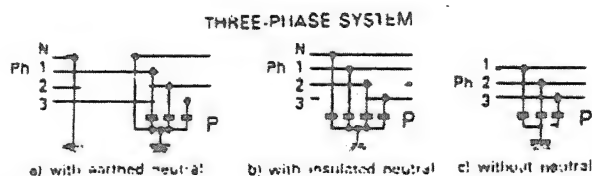


INSTALLATION CONDITIONS

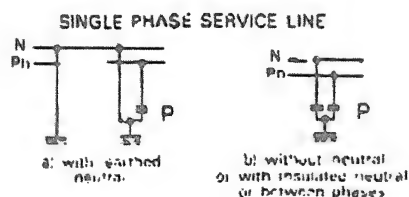
The overall protection of a low-voltage system must include:

- Surge diverters at each low voltage feeder, at the transformer station or near by;
- A few surge diverters at intervals along the lines;
- Surge diverters on each service line or group of service lines in the lightning zone.

Installation is as in the following diagrams, depending on whether the neutral is earthed or insulated. In systems with an earthed neutral, the same earth connection should be used for the neutral and the surge diverters.

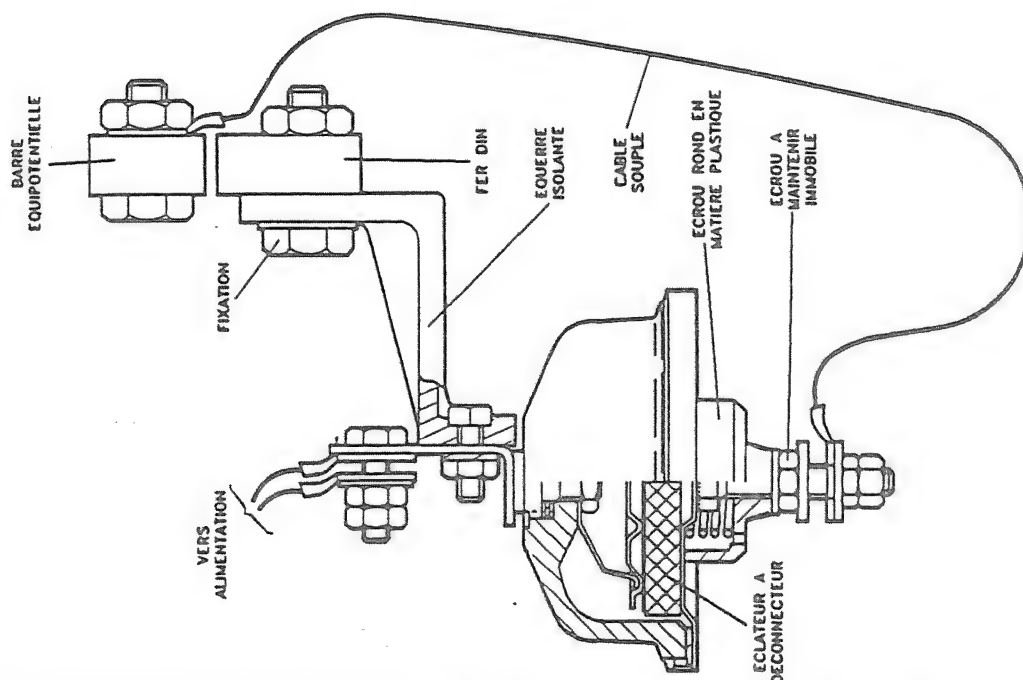
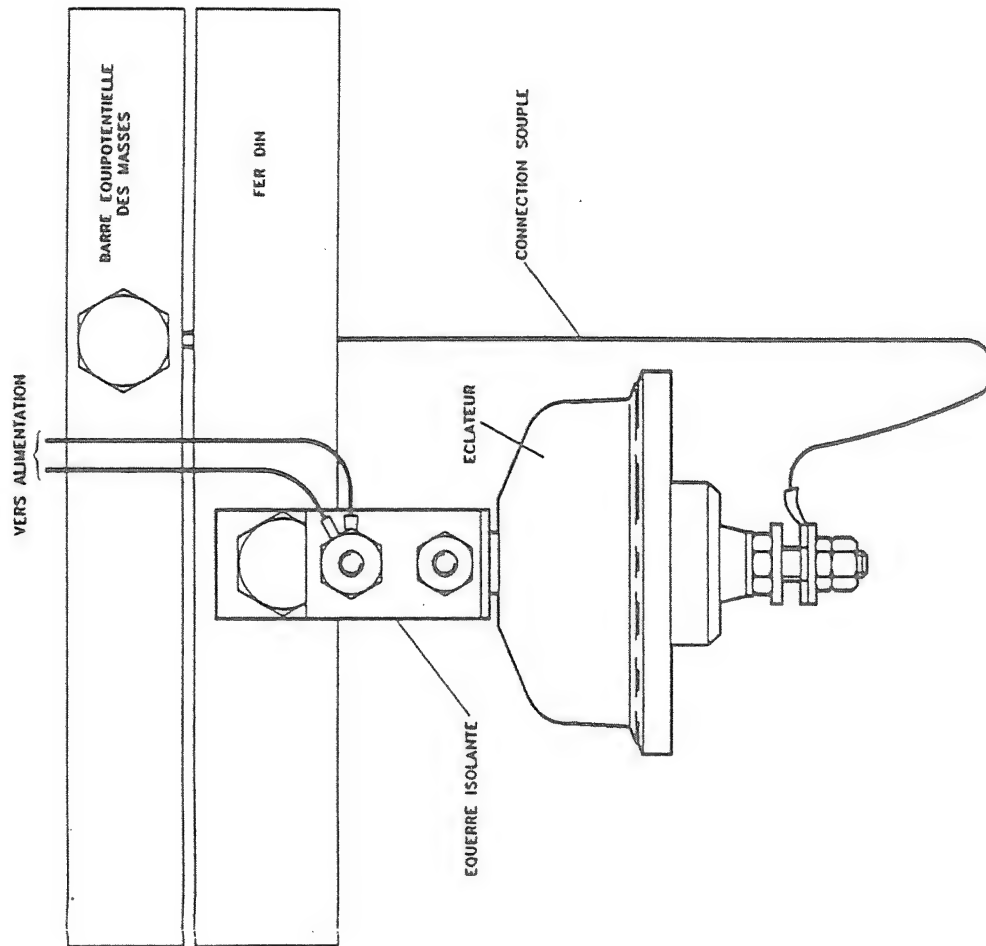


Remember that the system protection is only fully effective if the surge diverter earth connections have a low resistance



IMPORTANT NOTE: Depending on the installation and service conditions, surge diverters 8134 and 8137 may be mounted outdoors as well as indoors; in addition, the accessories supplied with the devices allow them to be suspended or mounted on a bracket.

WE ARE PLEASED TO EXAMINE SPECIAL APPLICATIONS ON REQUEST



APPENDIX 27

UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323	1	2	
	Page 132			

TRANSMITTER AJUSTMENT TABLE "KEM"

KEM	TRANSMITTER CONNECTION		
	cable		liaisons
3	V4	V7	V5 to V6
3.25	V1	V7	V2 to V4 V5 to V6
3.50	V2	V7	V3 to V4 V5 to V6
3.75	V1	V7	V3 to V4 V5 to V6
4	V7	V8	*****
4.25	V1	V8	V2 to V7
4.50	V2	V8	V3 to V7
4.75	V1	V8	V3 to V7
5	V4	V8	V5 to V7
5.25	V1	V8	V2 to V4 V5 to V7
5.50	V2	V8	V3 to V4 V5 to V7
5.75	V1	V8	V3 to V4 V5 to V7
6	V6	V8	*****
6.25	V1	V8	V2 to V6
6.50	V2	V8	V3 to V6
6.75	V1	V8	V3 to V6
7	V4	V8	V5 to V6
7.25	V1	V8	V2 to V4 V5 to V6
7.50	V2	V8	V3 to V4 V5 to V6
7.75	V1	V8	V3 to V4 V5 to V6

RECEIVER ADJUSTMENT TABLE

" KRV "

KRV	R1 to	R2 to	connections	KRV	R1 to	R2 to	connections
1	R3	R4	*****	26	R9	R5	R4-R6 & R7-R8
2	R5	R4	*****	27	R9	R4	R3-R6 & R7-R8
3	R3	R5	*****	28	R9	R6	R7-R8
4	R5	R7	R3-R6	29	R9	R3	R4-R6 & R7-R8
5	R5	R7	R4-R6	30	R9	R4	R5-R6 & R7-R8
6	R4	R7	R3-R6	31	R9	R3	R5-R6 & R7-R8
7	R6	R7	*****	32	R10	R7	R5-R6 & R3-R9
8	R3	R7	R4-R6	33	R10	R7	R5-R6 & R4-R9
9	R4	R7	R5-R6	34	R10	R7	R4-R6 & R3-R9
10	R3	R7	R5-R6	35	R10	R7	R6-R9
11	R9	R7	R3-R8 & R5-R6	36	R10	R7	R3-R6 & R4-R9
12	R9	R7	R4-R8 & R5-R6	37	R10	R7	R4-R6 & R5-R9
13	R9	R7	R3-R8 & R4-R6	38	R10	R7	R3-R6 & R5-R9
14	R9	R7	R6-R8	39	R10	R5	R3-R9
15	R9	R3	R4-R7 & R6-R8	40	R10	R5	R4-R9
16	R9	R4	R5-R7 & R6-R8	41	R10	R4	R3-R9
17	R9	R3	R5-R7 & R6-R8	42	R10	R9	*****
18	R9	R5	R3-R8	43	R10	R3	R4-R9
19	R9	R5	R4-R8	44	R10	R4	R5-R9
20	R9	R4	R3-R8	45	R10	R3	R5-R9
21	R9	R8	*****	46	R10	R5	R3-R6 & R7-R9
22	R9	R3	R4-R8	47	R10	R5	R4-R6 & R7-R9
23	R9	R4	R5-R8	48	R10	R4	R3-R6 & R7-R9
24	R9	R3	R5-R8	49	R10	R6	R7-R9
25	R9	R5	R3-R6 & R7-R8	50	R10	R3	R4-R6 & R7-R9

RECEIVER AJUSTMENT TABLE

"KRV "

KRV	R1 to	R2 to	connections
51	R10	R4	R5-R6 & R7-R9
52	R10	R3	R5-R6 & R7-R9
53	R10	R7	R5-R6 & R3-R8
54	R10	R7	R5-R6 & R4-R8
55	R10	R7	R4-R6 & R3-R8
56	R10	R7	R6-R8
57	R10	R7	R3-R6 & R4-R8
58	R10	R7	R4-R6 & R5-R8
59	R10	R7	R3-R6 & R5-R8
60	R10	R5	R3-R8
61	R10	R5	R4-R8
62	R10	R4	R3-R8
63	R10	R8	*****
64	R10	R3	R4-R8
65	R10	R4	R5-R8
66	R10	R3	R5-R8
67	R10	R5	R3-R6 & R7-R8
68	R10	R5	R4-R6 & R7-R8
69	R10	R4	R3-R6 & R7-R8
70	R10	R6	R7-R8
71	R10	R3	R4-R6 & R7-R8
72	R10	R4	R5-R6 & R7-R8
73	R10	R3	R5-R6 & R7-R8

APPENDIX 28

DATA SHEET

Part one

TRACK CIRCUIT N°:
 FREQUENCY : Hz

RAILWAY :
 STATION :
 TRACK :

TRACK CIRCUIT LENGTH : m

IT
branch 1 : <input type="text"/> m
branch 2 : <input type="text"/> m

TRANSMISSION

- Configuration

ESJ	IRJ	IT
-----	-----	----

 - Pk of transmission point : Km
 - cable length : m

RECEPTION 1

- Configuration

ESJ	IRJ
-----	-----

 - Pk of reception point : Km
 - Cable length : m

Compensation Branch 1

length half-step : m
 capacitors number:
 capacitors value : μ F

RECEPTION 2

- Configuration

ESJ	IRJ
-----	-----

 - Pk of reception point : Km
 - Cable length : m

Compensation Branch 2

length half-step : m
 capacitors number:
 capacitors value : μ F

DATA COLLECTOR

- Pk of reception point : Km
 - Cable length : m

DATA SHEET

Part Two

 TRACK CIRCUIT N°:

 FREQUENCY : Hz

TRANSMISSION SERIAL NUMBERS				
Transmitter	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>
série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>
n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>

RECEPTION 1 SERIAL NUMBERS				
Receiver	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>
série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>
n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>

RECEPTION 2 SERIAL NUMBERS				
Receiver	Matching Unit	Tuning Unit "pole"	Tuning Unit "zero"	ACI
Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>
série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>
n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>

INFORMATION POINT IP	
Receiver	Matching Unit
Type : <input type="text"/>	Type : <input type="text"/>
série : <input type="text"/>	série : <input type="text"/>
n° : <input type="text"/>	n° : <input type="text"/>

PIN POINT DETECTOR PPD		
Receiver	PPD unit	Matching Unit
Type : <input type="text"/>	Type : <input type="text"/>	Type : <input type="text"/>
série : <input type="text"/>	série : <input type="text"/>	série : <input type="text"/>
n° : <input type="text"/>	n° : <input type="text"/>	n° : <input type="text"/>

DATA SHEET Part three

TRACK CIRCUIT N° :
FREQUENCY : Hz

TRANSMITTER ADJUSTMENT			
KEM : <input type="text"/>	KMU : <input type="text"/>	POWER <input type="text"/> Low <input type="text"/> High	SELF-MODULATION
Connections Cable $\left[\begin{array}{c} \rightarrow \\ \rightarrow \end{array} \right]$ - \rightarrow - - \rightarrow - - \rightarrow -	Connections Cable $\left[\begin{array}{c} \rightarrow \\ \rightarrow \end{array} \right]$ - \rightarrow - - \rightarrow - - \rightarrow -	Connections in high power M2 \rightarrow M4 M2 \rightarrow M5 nota : without connection in low power	Connections M1 \rightarrow M3

RECEPTION 1 ADJUST.		RECEPTION 2 ADJUST.		DATA COLLECTOR ADJUST.	
KRV : <input type="text"/>	KMU : <input type="text"/>	KRV : <input type="text"/>	KMU : <input type="text"/>	KRV : <input type="text"/>	KMU : <input type="text"/>
Connections R1 \rightarrow R ₋ R2 \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ C \rightarrow C2	Connections Cable $\left[\begin{array}{c} \rightarrow \\ \rightarrow \end{array} \right]$ - \rightarrow - - \rightarrow - - \rightarrow -	Connections R1 \rightarrow R ₋ R2 \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ C \rightarrow C2	Connections Cable $\left[\begin{array}{c} \rightarrow \\ \rightarrow \end{array} \right]$ - \rightarrow - - \rightarrow - - \rightarrow -	Connections R1 \rightarrow R ₋ R2 \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ R ₋ \rightarrow R ₋ C \rightarrow C2	Connections Cable $\left[\begin{array}{c} \rightarrow \\ \rightarrow \end{array} \right]$ - \rightarrow - - \rightarrow - - \rightarrow -

DATA SHEET
Part four

TRACK CIRCUIT N :

FREQUENCY : Hz

Length (m)	TRANSMITTER			TRACK TRANS.		TRACK RECEIPT		RECEIVER 1					
	KEI	V _{tx} (V)		V _T (V)		V _R (V)		V V1V2 (V)		KRV		V R1R2	
		min.	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.	max.

RECEIVER 2					
V V1V2 (V)		KRV		V R1R2	
min.	max.	min.	max.	min.	max.

T. CIRCUIT N :
 FREQUENCY : Hz

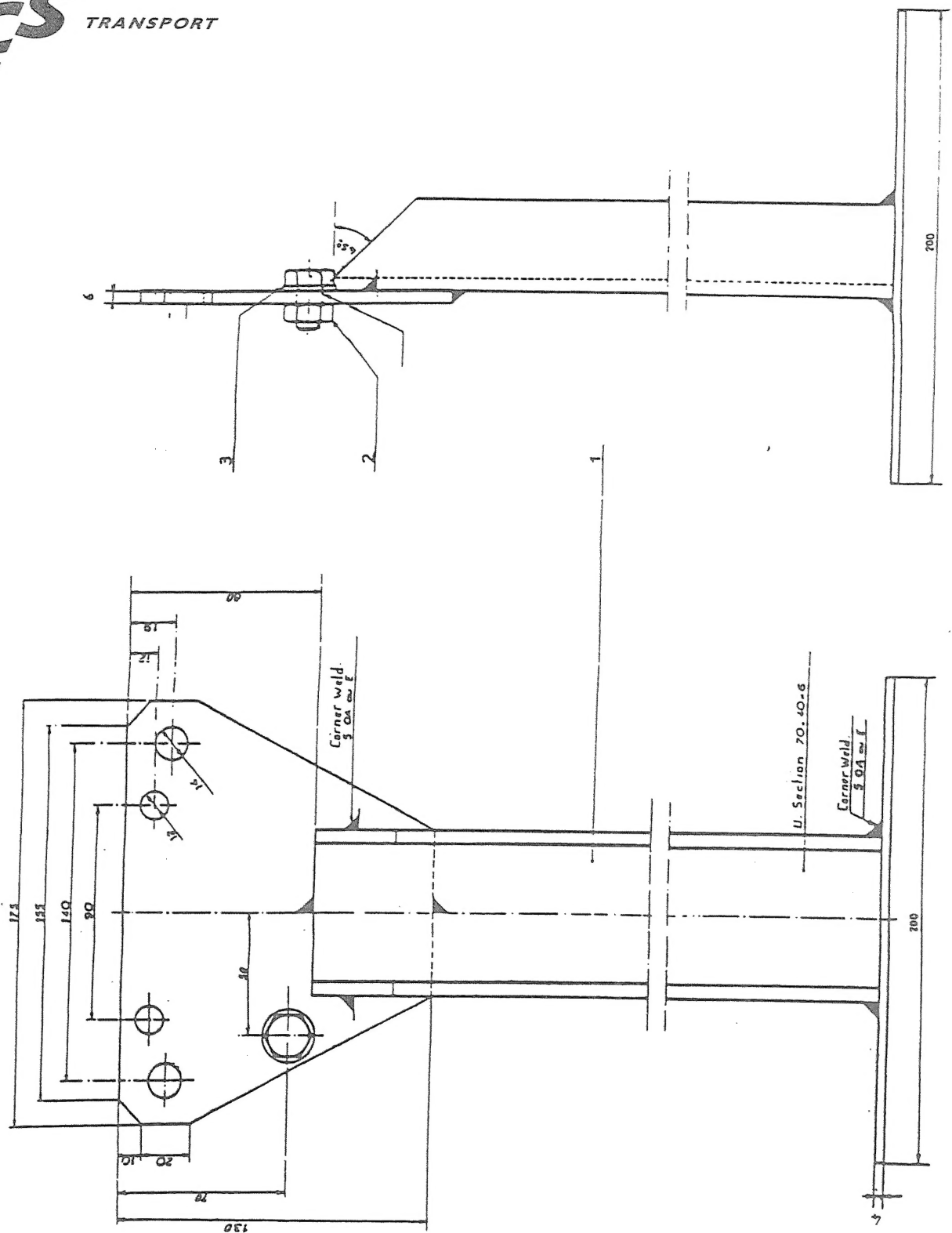
DATA SHEET Part five

DATE	CLIMATIC CONDITIONS	TRANSMITTER			TRACK TRANS VT (V)	TRACK RECEP. VR (V)	RECEIVER			RECEPTION CONFIGURATION
		Val (V)	Vtx (V)	Ibx (A)			Val (V)	V V1V2	V R1 R2	
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector
										reception 1
										reception 2
										recep. data collector

APPENDIX 29

UM71 TRACK CIRCUIT INSTALLATION MANUAL	CTR/SPS/GML/95/40.323			1	2	
	Page 134					

MOUNTING STAKE



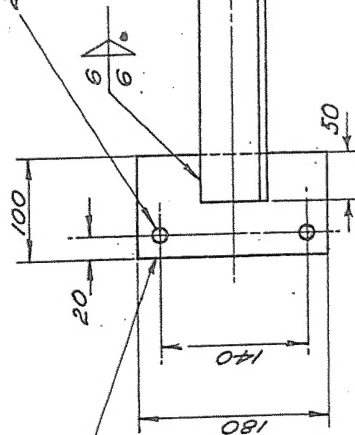
RECORD DRAWN
R. 25617
NEW SERIES
DATE

C1-61

Finish:- Hot dip galvanised.

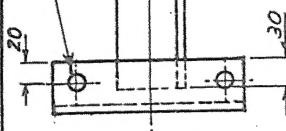
2-drill 12φ

8 M.S. Flat



IM-F5723

4-drill 12φ



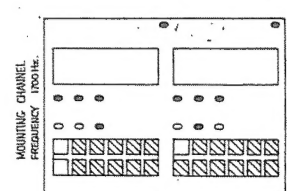
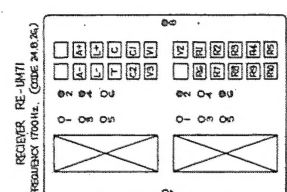
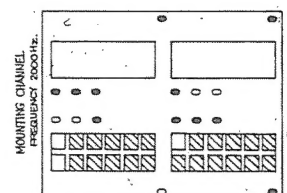
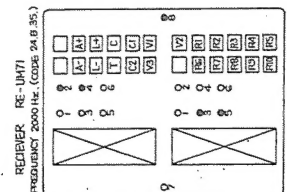
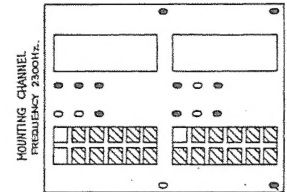
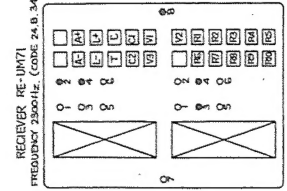
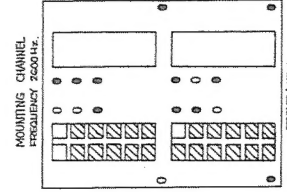
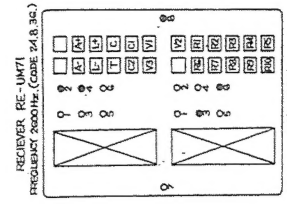
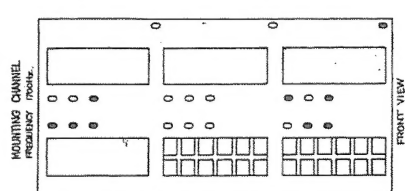
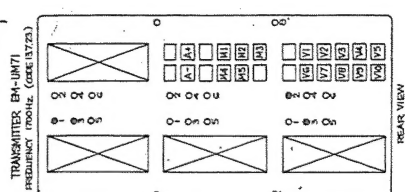
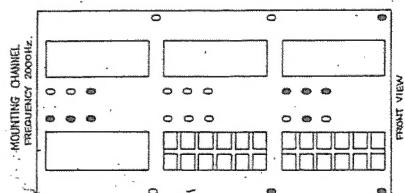
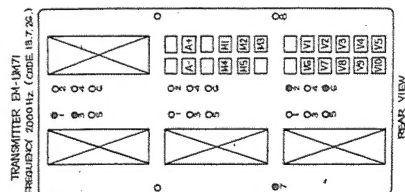
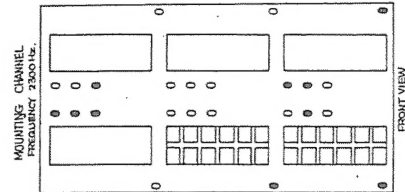
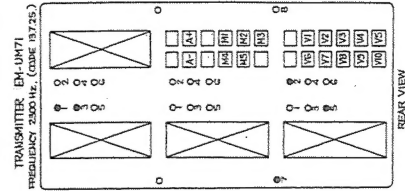
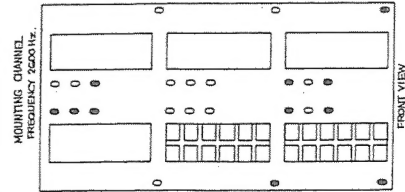
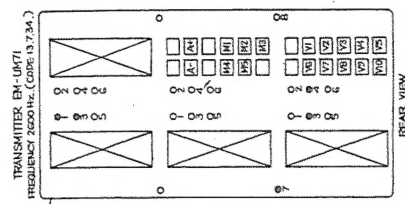
102x51x6 M.S. Channel.

For all other details see IM-F5723.

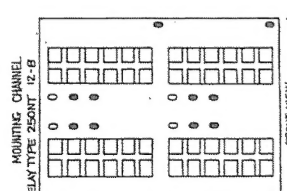
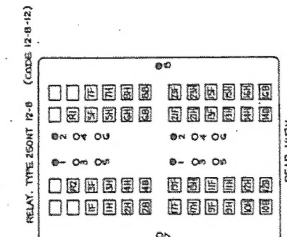
M.S. POST

2M-F5723

A		7-9-84	This drawing is to the metric standard (I.S.O). Dimensions are in millimeters. Tolerances unless otherwise stated ± 0.5	C.S.E.E. TRACK CIRCUIT TRACKSIDE BOXES SUPPORT POST	S.D.C. Engineer <i>MJR</i>	Designed <i>M.J.R.</i>	Drawn <i>M.J.R.</i>	M-F 5723
Part No 2M-F5723 added		S.D.E. ME <i>MJR</i>				Ckd. Iss. No <i>513</i>		
W.	101	300	ANGLE PROJECTION on	22-11-74				



NOTES:
1. CONTACT POSITIONS AS SHOWN ARE NOT SHOWN ON EQUIPMENT.
2. 0 SYMBOL INDICATES RUBBER PLUG FITTED.
3. 0 SYMBOL INDICATES CODE PIN FITTED.



VICTORIAN RAILWAYS
C.S.E.E. TRACK UNITS
CONNECTION & CODING DETAILS.
2-9-76.

SBC Engineer
Designed
Drawn
JCT
15

B5521